CANADA
DEPARTMENT OF MINES
GEOLOGICAL SURVEY
HON. ROBERT ROGERS, MINISTER; A. P. LOW, DEPUTY MINISTER;
R. W. BROCK, DIRECTOR.

MEMOIR No. 35

RECONNAISSANCE ALONG THE NATIONAL TRANSCONTINENTAL RAILWAY IN SOUTHERN QUEBEC

BY

JOHN A. DRESSER

OTTAWA
GOVERNMENT PRINTING BUREAU
1912.

No. 1186

Frontispiece

Plate I

4944

A quartzite hill, Kamouraska county, Que.

CANADA
DEPARTMENT OF MINES
GEOLOGICAL SURVEY
HON. ROBERT ROGERS, MINISTER; A. P. LOW, DEPUTY MINISTER;
R. W. BROCK, DIRECTOR.

MEMOIR No. 35

RECONNAISSANCE ALONG THE NATIONAL TRANSCONTINENTAL RAILWAY IN SOUTHERN QUEBEC

BY

JOHN A. DRESSER

OTTAWA
GOVERNMENT PRINTING BUREAU
1912.

No. 1186

4944—A

To R. W. Brock, Esq.,
Director,
Geological Survey,
Department of Mines,
Ottawa, Canada.

Sir,—I beg to submit the following report of a reconnaissance made during the season of 1908 along the line of the National Transcontinental railway, in southern Quebec.

I have the honour to be, sir,
Your obedient servant,

John A. Dresser.

Ottawa, April 29, 1911.

CONTENTS

PAGE

ILLUSTRATIONS.

Photographs.

ILLUSTRATIONS—*Continued.*

Photographs—Continued.

Drawings.

Maps.

RECONNAISSANCE ALONG THE NATIONAL TRANSCONTINENTAL RAILWAY IN SOUTHERN QUEBEC.

BY

John A. Dresser.

INTRODUCTION.

General Statement and Acknowledgments.

The following report gives the results of a reconnaissance made during the summer of 1908 along the line of the National Transcontinental railway in the Province of Quebec, south of the St. Lawrence river. The geological structure of the southwestern part of this district has been studied at various times by officers of the Geological Survey and others, and its general features at least are well known. But the northwestern portion of the district has received much less attention. The National Transcontinental railway, which is now being built, will give good transportation facilities to a large part of the district which, hitherto, has been difficult of access, and thus introduce a new and very important factor in the commercial possibilities of the region.

The field work was much facilitated by the assistance of various officers of the National Transcontinental railway. I must also acknowledge with thanks the efficient services rendered by Messrs. Alex. MacLean and R. Randal Rose, graduate students of Toronto University, who acted as field assistants.

As the section of the railway along which the examination was required runs nearly parallel to the strike of the rocks, and as the principal roads run nearly at right angles to this course, it was found best to carry on the reconnaissance by making a series of cross traverses. These were connected along the line of railway and in other places where it was possible to do so.

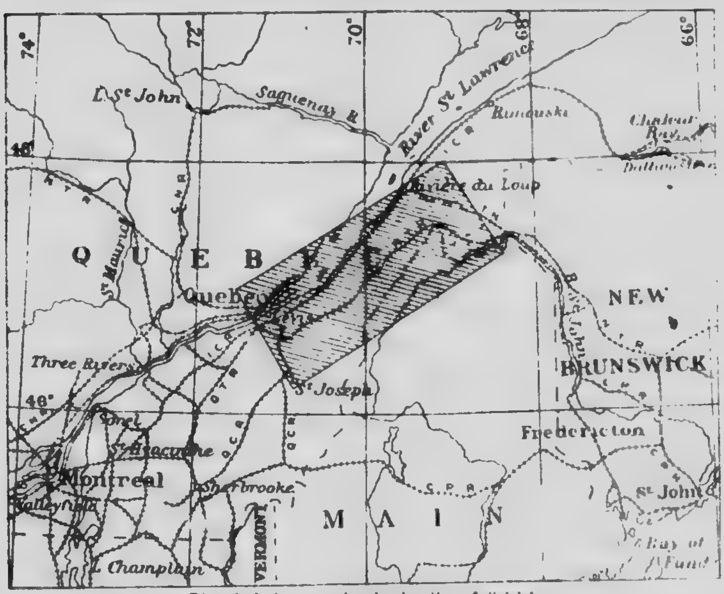
The map used in the field was a copy of the National Transcontinental Railway's map, which had been compiled from the official map of the Department of Lands, Forests, and Fisheries of the

Province of Quebec, checked by railway surveys. This map is on a scale of 4 miles to 1 inch; but an enlargement to 1 mile to 1 inch was used in a few cases. Geological features and additional roads and streams were located by means of surveys made by prismatic compass and pacing or chaining, which were checked where possible by municipal or railway lines.

The time occupied in the field was three months. The object of the investigation was to ascertain the commercial possibilities of the district in view of the early completion of the National Transcontinental railway. Greater attention was necessarily given to the mineral, timber, and agricultural resources, and the possibilities of their better development under improved means of transportation. But the geological structure received such attention as it was suitable and possible to give under these circumstances. Yet many of the purely scientific conclusions must be regarded as provisional.

Location and Area.

The district thus examined extends from the neighbourhood of



Diag. 1. Index map showing location of district.

the city of Quebec to the interprovincial boundary between Quebec and New Brunswick, and lies between the St. Lawrence river and the State of Maine. It is about 120 miles from southwest to north-

east, and throughout much of this distance is between 30 and 40 miles in breadth. The report thus deals with portions of the counties of Lévis, Dorchester, Bellechasse, Montmagny, L'Islet, Kamouraska, and Témiscouata.

History.

The portion of this district which borders on the St. Lawrence river contains some of the oldest settlements in Canada. In the early days of the French regime, when the St. Lawrence river provided the only means of access to the interior, and Quebec was the principal town of Canada, small settlements were made at numerous bays and landing places along the south shore, where the towns and villages are found at the present day. Many of the inhabitants of this part of the district bear the names of the pioneer families of New France, and the homesteads of these early settlers are yet sometimes held by their lineal descendants. But the early settlements were confined practically to the river shore.

The first railway in the district was built about 1856 by the Grank Trunk railway. It extended from Lévis to Rivière du Loup, following the south shore of the St. Lawrence river. Soon after the confederation of the older provinces into the Dominion of Canada, in 1867, this line was bought by the Dominion Government, and has since been a part of the Intercolonial Railway system which was then established to improve the connexion of the Maritime Provinces with the central and western parts of Canada.

At various times since 1860 the Provincial Government has built, or aided in the building of wagon roads leading from the settlements along the Intercolonial railway to the boundary of the State of Maine, and has connected these by a similar road (Taché) which runs in a northeasterly direction from Buckland to Chabot. But few settlements of importance were made more than 5 miles from the railway, owing largely to peculiar surface features which will be noted later.

Previous Work.

In the early years of the Geological Survey a traverse was made along the St. Lawrence river by Sir William Logan, who also carried his investigations some distance inland. The results appear in the

general report[1] of 1863, chiefly in the discussion of the Quebec Group. In 1868 the late James Richardson made a reconnaissance throughout the district, and published a report[2] and map. Nearly twenty years later Messrs. Bailey and McInnes made a geological survey of the adjacent territory in northern New Brunswick,[3] and carried their work into the northern part of this district.

The southwestern portion of the district has received more frequent attention from geologists, especially in connexion with a controversy that was carried on for several years regarding the structure and age of the Quebec Group. Some account of this discussion, and a general description of the region as far north as the county of L'Islet, are given in a report[4] on the area covered by the northeast quarter sheet of the Eastern Townships map by the late Mr. R. W. Ells.

About the same time the late R. Chalmers made an examination[5] of the surface geology of a large area, including the greater part of this district.

SUMMARY AND CONCLUSIONS.

As to its surface features, the district consists of a central highland belt which is bordered on the northwest by a narrow plain running along the St. Lawrence river, and on the southeast slopes gradually into the valley of the St. John river. The plain varies in elevation from 100 feet to 150 feet above tide water, and is sharply separated from the highland by a pronounced fault escarpment. The highland has an average elevation of about 1,000 feet above sea-level, being higher in the northeastern part and declining towards the southwest. It is well dissected, and gives a landscape of subdued hills and broad and rather deep valleys. The highland declines gradually on the southeast into the St. John valley.

The district has been glaciated by ice movements from the north-northwest, and the rock surface is generally, and in places, heavily, covered by soil. In the lowlands and in some of the larger valleys of the upland the soil is stratified, the layers consisting of clay, sand, and loam.

[1] Logan, Sir W. E., Geology of Canada, 1863, pp. 225 et seq.
[2] Richardson, James, Geological Survey, Canada, Report of Progress, 1869.
[3] Bailey, L. W., and McInnes, W., Geological Survey, Canada, Annual Reports, 1887 and 1891.
[4] Ells, R. W., Geological Survey, Canada, Annual Report, 1887.
[5] Chalmers, R., Geological Survey, Canada, Annual Report, 1887.

Plate II

Schists of L'Islet formation, Lake Pohenagamuk, showing intense foliation.
(Natural size.)

4944—p. 4

Plate III

Kamouraska Conglomerate, St. Philippe-de-Neri.

The rocks are principally sedimentary. In the eastern part of the central highland there is a pronounced unconformity. The rocks on the east side are believed to be of Ordovician age, and those on the west to be mainly Cambrian as far as the St. Lawrence river. On the north side of the St. Lawrence the Laurentian rocks of the great Pre-Cambrian protaxis of northern Canada appear.

All the sedimentary rocks are highly folded, and in many places the folds have been overturned always to the northwest. Faults are frequently found running both parallel and transversely to the folds.

Along the unconformable contact referred to above there are several intrusions of igneous rocks which range in composition from diabase to peridotite or serpentine. They are essentially similar to many parts of the serpentine belt of southern Quebec. With the exception of a few small occurrences of diabase in the southern part of the flat country near the St. Lawrence, these are the only igneous rocks yet known in the district.

The igneous rocks have been somewhat foliated, but on the whole they have suffered less regional metamorphism than the sediments.

Small quantities of asbestos were seen in the serpentine, and traces of chromite and chalcopyrite in serpentine and diabase in the county of Montmagny. Slate of good commercial quality occurs near the National Transcontinental railway in the county of Témiscouata, and quartzite of high purity is found near the St. Lawrence river in Kamouraska. There is also a small quantity of bog iron ore, and one or more large peat bogs. On the whole the mineral prospects of the district are not of great promise.

Lumbering has been carried on for many years, and there is yet much valuable timber land, especially pulpwood areas, in the northern and eastern parts of the district. The soil along the St. Lawrence is generally good and has long been successfully tilled. The central part is not so well adapted for farming, being more hilly and rocky. But there is good water, and judging from the small portions now cleared, this part of the district is well suited for grazing land. The soil of the eastern part is the best in the district, and when the land is cleared this area should be well adapted to mixed farming.

Lack of railway access has hitherto retarded development to a great degree, and in such settlements as have been made in the interior the inhabitants seem to depend for their support nearly as much on the lumber industry as on the tilling of the land. The building of the National Transcontinental railway and the projected extension of the Quebec Central railway from St. Justine to Cabano will, when completed, give greatly improved and much needed means of transportation. Owing to the peculiar topography of the district, these lines will not seriously compete with each other, or with the Intercolonial railway, in local traffic at least, as each will serve an area that could not be well served by the others.

The district may be expected (1) to have its lumber industry greatly stimulated; (2) to be rapidly opened for settlement along the new railways; (3) to develop an important district for dairying and mixed farming. It should also yield a valuable output of slate for roofing and other purposes, and may possibly produce some of the minerals already mentioned.

GENERAL CHARACTER OF THE DISTRICT.

Topography.

GENERAL.

The region of which this district forms a part comprises three distinct topographic areas, (1) the Laurentian highlands, (2) the St. Lawrence lowlands, and (3) the Appalachian highlands.

The Laurentian highlands lie north of the St. Lawrence river, whence they extend northward and westward to Hudson straits and the Arctic ocean. They have been described by Wilson[1] as an uplifted peneplain whose incised southern edge gives the appearance of a mountain range when viewed from the St. Lawrence river or lowlands. It is probably from this reason that the name Laurentian "Mountains" has obtained popular usage.

The St. Lawrence lowland, as its name implies, is an area of less elevation which borders the St. Lawrence river. It occurs principally on the south side of that river and extends westward with some interruptions to Lake Huron, and the upper part of the Ottawa river. Its surface features are described in some detail in the discussion of local topography.

The Appalachian highlands which bound the St. Lawrence lowland on the southeast consist of a succession of parallel ridges and valleys running in a northeasterly direction. They form a part of the great uplifted area of eastern North America which extends from Georgia to Newfoundland and includes all the mountain ranges generally grouped under the Appalachian system.

The divisions described locally in the following pages under the titles "Midland upland" and "St. John slope" belong in this area:—

[1] Wilson, A. W. G., "The Laurentian Peneplain," Journal of Geology, 1906.

Plate IV

The St. Lawrence lowland, looking towards the St. Lawrence river from the front of the upland, at St. Philippe-de-Neri, county of Kamouraska. Pre-Cambrian highlands in the background.

4944---p. 6.

LOCAL.

The district consists of three physiographic divisions which form parallel belts running in a northeasterly direction. They are generally, but not everywhere, well defined. They may be distinguished as (1) the St Lawrence lowland; (2) the middle upland; (3) the St. John slope.

The St. Lawrence Lowland.—The St. Lawrence lowland is a narrow strip of land along the St. Lawrence river and is between 4 and 6 miles wide, except in the southwestern part of the district where it becomes considerably wider. It is usually between 100 feet and 150 feet above sea-level. A narrow portion of the lowland reaches the north shore of the St. Lawrence river, extending from the southern limits of the map-sheet as far northeast as Cape Tourmente, about 40 miles from Quebec city, but the greater part is south of the St. Lawrence. The even surface of this plain is broken only by a few sharp hills or buttes, which can be well seen from the Intercolonial railway in passing through the county of Kamouraska. These hills are composed mainly of quartzite which has resisted erosion so much better than the soft slates and shales by which they are surrounded, as to give them their present relief above the surrounding country.

The soil on the lowland, though less productive than in some other parts of the St. Lawrence plain, is usually fertile, and affords much good farming land. It has long been settled, no forest remains, and it supports a rather dense population for an agricultural district in Canada.

The Middle Upland.—Bounding the lowland on the southeast there is an abrupt escarpment due to an extensive fault which has its downthrow on the northwest. This escarpment is well defined from the eastern part of Bellechasse to the central part of the county of Kamouraska, a distance of about 65 miles. At its greatest height, in the county of Montmagny, the escarpment rises from 700 feet to 1,000 feet. As this elevation is attained in going from 1 mile to 1½ miles towards the southeast it forms a serious obstacle to transportation from the St. Lawrence and gives a very definite difference to the value of land above and below it.

The surface of the upland is less uniform than that of the lowland along the St. Lawrence river. It is deeply cut by valleys running both longitudinally and transversely, yet on the whole it maintains a somewhat uniform though roughly rolling surface. The mean elevation for a distance of 15 or 20 miles southeast of the fault escarpment is about 1,000 feet above sea-level. Along the southeastern edge of the upland a range of hills rises somewhat above the average level, and the general elevation becomes somewhat greater in the northeastern part of the district, where hills of 2,000 feet above sea-level are not uncommon.

Except in the southwestern part of the district, where the topography is less pronounced, the upland belt is only sparsely settled and much of it yet remains heavily timbered. Along the height of land between the St. Lawrence and the St. John rivers, where streams are too small to float logs, valuable timber and pulpwood are burned on the land where clearings are made. But the completion of the National Transcontinental railway, which generally follows the height of land, will give this timber a marketable value.

At present the settlements on the upland are fairly continuous as far northeast as the head of the river Sud. Beyond this the settlements are small and scattering and the country is correspondingly better wooded. The Government of the Province of Quebec has built wagon roads for colonization purposes at intervals of 10 or 20 miles from the 'front' or lowland, across the upland and in some places to the international boundary line (Plate V). But owing to the hilly character of the roads, largely due to the fault escarpment, and the fact that the soil along the northwestern border of the upland is inferior to that in the central and eastern parts, comparatively little settlement has resulted from the building of these roads. The opening of the railways now projected—the National Transcontinental and the Quebec Central—will materially change the values of lands in this belt.

The St. John Slope.—From the southeast limit of the upland the surface slopes rather evenly to the St. John river, in the State of Maine. The part of the St. John slope which lies in the Province of Quebec varies in width, but is generally between 5 and 10 miles wide. It is almost everywhere well wooded. The only settlements

Plate V

Pohenagamuk road. This is one of the wagon roads built by the Provincial Government between 1860 and 1875, to open the country for settlement between the St. Lawrence river and the boundary of the State of Maine. They have not led to the establishment of many permanent settlements.

4944---p. 8.

of importance are about the villages of St. Pamphile and St. Eleuthère, which are situated at the ends of the Elgin and Pohenagamuk roads. Both of these parishes have been settled for upwards of 50 years. Their early and successful settlement is apparently due to the fact that these two roads furnish easier access from the St. Lawrence, and the villages have grown up as distributing bases for lumber camps in the State of Maine.

This belt is drained by the Daaquam, Noire in several branches, and the St. François, all tributaries of the St. John.

AGRICULTURE.

In the older settled land along the St. Lawrence better conditions of agriculture prevail. At Ste. Anne de la Pocatière a model farm was established by the Provincial Government nearly 30 years ago, and the dairying industry is well organized, with the usual accompanying advantages to the farmers. But in the settlements of the upland, which are confined to small areas, the methods of farming are of a somewhat primitive character. Dairying is only partially organized, and the live stock is generally of a poor type.

The soil on the upland is light, in places sandy, and everywhere strewn with boulders. Yet there is ample rainfall in the district, constant springs and streams are numerous, and except for a narrow belt along the western border, the upland is well suited for dairying and much of it will admit of small mixed farming under favourable conditions of transportation. In the lowland along the St. Lawrence and on the St. John slope the soil is generally clay or clay loam, and is decidedly better suited for agriculture.

An idea is prevalent amongst many people only slightly acquainted with the district that farms have frequently been abandoned because the owners could not gain a livelihood from them. But a careful investigation does not show this to be the case. Many so-called abandoned farms are homesteads begun in timber berths, which the holders of the berths have bought in order to protect their limits from mutilation and the danger of fire. Others seem to have been taken nominally for colonization purposes, but really for the timber, and to have been abandoned after the land had been stripped of its lumber and pulpwood. The number of such abandoned loca-

tions is large, but they are more properly ascribed to the dominance of the lumber industry and lack of means of transportation necessary for farming, than to the sterility of the soil. When all its possibilities are considered, this district, unless for a slightly shorter summer season, may be considered similar in its agricultural possibilities to the counties of Megantic, Arthabaska, and Richmond, and to the hilly portions of Shefford and Brome, where mixed farming has been successful and dairying pre-eminently so for many years.

Transportation and Communication.—Although the Provincial Government during the past 50 years has built roads from the St. Lawrence lowland nearly or quite to the Maine boundary at intervals of 10 to 20 miles, and has also connected these by means of the Taché road, parallel to and some 20 miles from the Intercolonial railway, yet the settlements have advanced but very little. The escarpment dividing the lowland from the upland makes the hauling of supplies or produce a heavy tax on the farmer's resources—in fact on many of the roads a practically prohibitive one.

With the completion of the National Transcontinental railway, easy access and market facilities will be given to the middle upland section, with all the consequent advantages to the farmer. The clearing of the land, which at present is a heavy task without any direct financial return, will then, owing to the value given to the timber for pulpwood and fuel, yield the settler an immediate return for his labour. The diminished cost of bringing in supplies and the easier access to the markets of the cities and of shipping ports will greatly change the farmer's financial outlook. Much of the district will thus doubtless soon be settled by bona fide colonists.

The section designated as the St. John slope will not, however, be benefited in nearly the same degree, especially in the southwestern part of the district. There pronounced hills separate it from the middle upland, and the conditions of the early settler will consequently be less improved. The distance from the railway and the unavoidable hills to be crossed to reach it will still be a tax on the cost of production that will be sufficiently great to practically consume the value of the product.

But an extension of the Quebec Central railway which is projected to run from St. George de Beauce, on the Chaudière river,

to Cabano, on the Témiscouata railway, will, when carried out, serve the needs of this otherwise promising part of the district. The construction of this branch line has already begun, and it is in the interests of the district that it should be brought to an early completion.

Inhabitants.—The inhabitants of this district are almost entirely French Canadians. French is the prevailing language and the only one spoken by the majority of the people.

Organized schools are to be found in even the very small parishes, but the expenditure upon them is by no means lavish. The children and young people can usually read and write, and newspapers are commonly found in the farm houses.

The farmer, as a rule, spends his winter in the employ of some of the lumber companies, and in summer works his farm. Without this additional means of support, which is often greater than the revenue from the farm, it is doubtful if there would be many permanent residents in the district except on the St. Lawrence lowland.

The people have the usual characteristics of the French Canadian farmer, being economical, law-abiding, and contented. They make the best permanent settlers for such districts, and are less liable than English speaking colonists to be attracted by the greater financial prospects of the cities, or of western Canada.

GENERAL GEOLOGY.

General Statement.

REGIONAL.

North and west of the St. Lawrence river, which forms the northwestern boundary of the district examined, the country is chiefly underlain by rocks of Pre-Cambrian age which extend, with minor interrruptions, to the regions of Hudson strait and the Arctic ocean. On the south and east of the St. Lawrence the rocks are essentially of Palæozoic age as far as the Atlantic ocean and the Gulf of St. Lawrence. The district studied is, therefore, a portion of the Palæozoic area near the southeast margin of the great Pre-Cambrian protaxis of northern Canada.

Where the Palæozoic region bordering on the Pre-Cambrian in eastern Canada has not been greatly disturbed by regional move-

ments it presents a surface of low relief. The strata appear in ascending order in going away from the old land and dip away from it at a low angle, thus presenting the essential features of an old coastal plain. This is well shown on the island of Anticosti, and on the north shore of the St. Lawrence from Cap Tourmente westward to the upper part of the Ottawa valley. In eastern Quebec, however, the country south of the St. Lawrence river and east of Quebec city has been disturbed by the Appalachian uplift. Consequently the original structure has been greatly deformed and the earlier physiographic features quite obscured.

LOCAL.

The district described in this report is a part of the region affected by the Appalachian disturbances. It extends along the St Lawrence river for a distance of 120 miles and has an average breadth of 40 miles. It lies wholly on the south side of the St. Lawrence river.

For the first 40 miles below Quebec city, Palæozoic rocks are found on both sides of the St. Lawrence, but at Cap Tourmente the edge of the Pre-Cambrian is reached, and thence the river runs practically upon the contact of the Pre-Cambrian with the Palæozoic to the Gulf of St. Lawrence far beyond the limits of this map.

The sedimentary rocks of the district were deposited in two distinct periods of sedimentation, one Cambrian, the other Ordovician, which were separated by an evident time break. The igneous rocks are intrusive through Cambrian, and from evidences obtained southwest of this district, they are believed to be later than the Ordovician, and probably of Devonian age. However, no direct evidence of this was found in the district.

The sedimentary rocks have been strongly folded along axes which run either parallel to or about 10° north of the general course of the St. Lawrence river. The folds are asymmetrical, the northwest limbs of anticlines having a steeper dip than those on the southeast, and in places the folds are overturned, giving a general dip to the southeast, generally of 75° or more.

The fault zone which gives rise to the prominent escarpment already mentioned is a conspicuous structural feature of the district

It extends for a distance of nearly 70 miles and runs approximately parallel to the St. Lawrence river, that is to the edge of the Pre-Cambrian old land. It is not a single fault but a series of faults that make a zone of dislocation that is practically continuous for the distance mentioned above. In places several individual faults are parallel to one another and give a step fault relief. In other cases the faults succeed one another en echelon, offsetting either to the right or the left, and thus giving curves to the face of the escarpment they produce. The relief of the escarpment is generally modified by the accumulation of drift and more recent debris at its foot. In Montmagny and L'Islet it is upwards of 1,000 feet, but grows less towards either end. The downthrow appears to be always on the northwest side. This fault zone is evidently a part of the Champlain-St. Lawrence fault, a great dislocation that was first recognized by Logan[1] and was considered by him to extend from the north end of Lake Champlain to Quebec city and the lower St. Lawrence, and possibly to the Straits of Belle Isle, between the coasts of Newfoundland and Labrador.

Table of Formations.

Quaternary.		Bog deposits, peat and iron ore, stratified clays and sands; unassorted glacial drift.
	UNCONFORMITY.	
Devonian?	Talon. (Serpentine belt.)	Diabase, pyroxenite, peridotite, serpentine.
	INTRUSIVE CONTACT.	
Ordovician.	Pohenagamuk. (Farnham.)	Black argillaceous slates and intercalated limestones; conglomerate.
	UNCONFORMITY.	
Cambrian (Upper).	Sillery.	Red and green slates and sandstones.
	L'Islet.	Black, or dark grey ferruginous, schists with interbedded quartzites.
	PROBABLE UNCONFORMITY.	
(Middle or lower?)	Kamouraska.	Quartzites and interbedded conglomerates.

[1] Geology of Canada, 1863, p. 234.

DESCRIPTION OF FORMATIONS.

Kamouraska.

DISTRIBUTION.

The rocks referred to this formation are provisionally separated from the Sillery formation by which they are surrounded. They consist of quartzites and conglomerates, and form a series of detached hills which stand out prominently on the St. Lawrence lowland in the western part of the counties of Kamouraska, L'Islet, and a part of Montmagny (see Plate I—Frontispiece). The greater number of them occur in a distance of 40 miles from northeast to southwest, and over a breadth, including intervening Sillery, of 4 miles or less. Northeast of Kamouraska bay they probably form several islands also that were not examined in the course of this reconnaissance.

LITHOLOGICAL CHARACTERS.

Quartzite.—The quartzite is fine, even grained, light coloured, and weathers to an almost pure white. Quartz is usually the only mineral that can be distinguished in the hand specimen, but in places the quartzite contains nodules of dolomitic sandstone. These nodules are occasionally found as large as 2 feet in diameter. They are ellipsoidal or cylindrical in shape, suggesting concretionary origin. They disintegrate more readily than quartzite under the action of the atmosphere, and give a pitted surface in exposed places.

In the thin section the quartzite is seen to be composed of rounded grains of quartz cemented by secondary silica. The original grains being uniformly small, the secondary enlargement, though observed, is not very distinct. The rock closely resembles the Potsdam sandstone of Lachute, Que., or other well known localities along the margin of the Pre-Cambrian.

Conglomerate.—Interstratified with the quartzite above described are beds of conglomerate from a few inches to 25 feet in thickness. The matrix of the conglomerate is a dolomitic sandstone and the included pebbles are limestone, slaty sandstone having its bedding set at all angles with the lamination of the matrix, quartz, and occasionally granite, apparently Laurentian. The pebbles are usually small, an inch or two in diameter, but occasionally they are as much as 2 feet in diameter (Plate III). Many of the limestone

pebbles are crystalline, but those which are not occasionally carry fossils. Under the microscope the matrix of the conglomerate appears to be similar in all essential respects to the dolomitic nodules which are found in the quartzite.

Both the quartzite and conglomerate are highly metamorphosed. Recrystallization is apparent in the quartzite, and evidences of foliation and crushing are observable in both rocks. Atmospheric erosion has given a rough surface to the conglomerate, but has had little effect on the quartzite.

STRUCTURAL RELATIONS.

These rocks form a series of detached hills which are seldom more than 300 feet high or a couple of miles in length, and most of them are much smaller (Plate I). In the ground plan they are much flattened ellipses, the longer axes running in a northeasterly direction. In structure they are sharply folded anticlines, slightly overturned towards the northwest, giving a general dip to the southeast of about 75°. They are also domed so as to give a pitch of 15° or 20° to the northeast and southwest near the ends of many of the hills. The course of the chief glaciation has been nearly at right angles to the trend of these ridges, and the central parts of some of the domes have been broken away by the ice, leaving the extreme ends of a hill pitching away from each other and separated by a drift covered interval. Figs. 1 and 2 are plans of such portions of different hills prepared from chain and compass surveys made by Messrs. MacLean and Rose.

The Kamouraska is surrounded by the Sillery formation. The actual contact is rarely exposed, but the Sillery is found on all sides of the Kamouraska as a whole and in many places between the different hills. It is also found in contact with the Kamouraska at all places where the contact can be seen, with the possible exception of one small exposure of greyish-brown slate three-fourths of a mile north of St. Philippe-de-Neri, which may be a part of the L'Islet formation.

Faults are frequently found in the Kamouraska running parallel to the bedding, and the northwest sides of several of the hills appear to be fault faces. The faults usually take place in the conglomerate, which is evidently a weaker rock than the quartzite. Where Sillery

Fig. 1. Quartzite hill, with conglomerate, at St Philippe-de-Neri, Que.

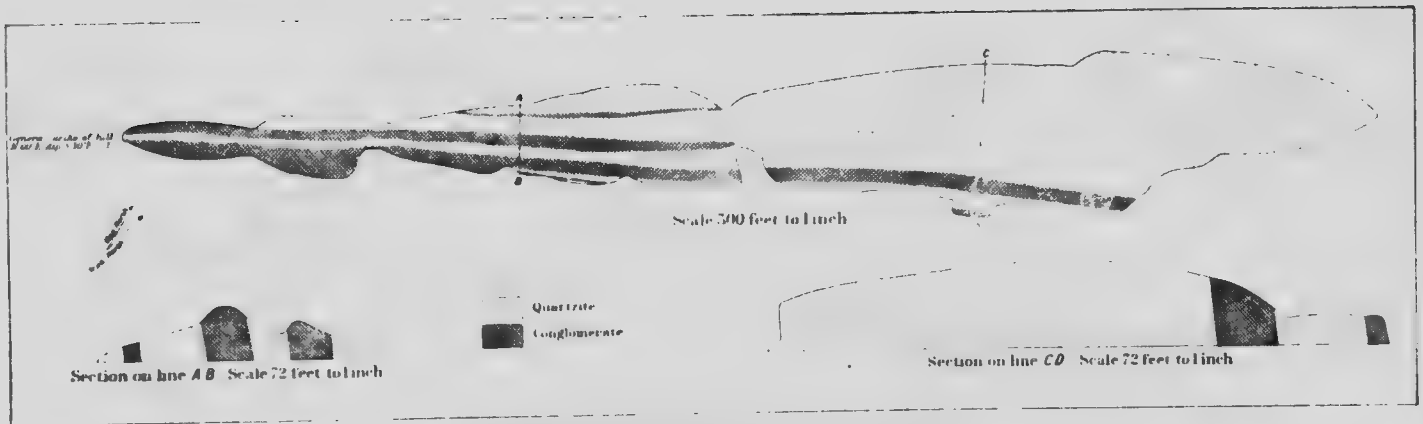


Fig. 2. Quartzite hill, with conglomerate, at St. Philippe-de-Neri, Que.

is found in contact with Kamouraska at the ends of hills, the Sillery dips away from the Kamouraska in all directions, suggesting that the contact is unconformable. The deflection of the strike of the Sillery in such cases is in places from 20° to 30° near the Kamouraska. Further evidence of unconformable contact is also found in the discordance of the general strike in the two formations. As a glance at the map will show, the individual exposures of the Kamouraska have a trend somewhat east of the general direction of the length of the formation as a whole. The strike in the Kamouraska is usually parallel to the longer axes of the individual exposures, while the strike of the Sillery agrees more closely with the direction of the Kamouraska formation. These facts, together with the greater metamorphism of the Kamouraska, seem to strongly suggest that the contact between them is unconformable.

MODE OF ORIGIN.

The quartzite has evidently had its origin in a sandstone formed from the waste of quartz-bearing rocks, such as Laurentian granite, or some siliceous sediment derived from it. The matrix of the conglomerate appears to have been derived in part from the same material with the addition of carbonates of lime and magnesia. The limestone pebbles in the conglomerate are plainly fragments derived from the breaking down of a bed of limestone of earlier age, the nearest occurrence of which is now known only near the Straits of Belle Isle on the Labrador coast. The other pebbles are not characteristic of any local formations, and are so widely varied that their source can only be a matter of conjecture.

AGE AND CORRELATION.

Palæontological Evidence.—The fossils obtained from the Kamouraska conglomerate are not sufficiently numerous or distinctive to clearly determine the age of the rocks in which they occur, and, moreover, all are taken from the limestone pebbles. Mr. Percy E. Raymond, Invertebrate Palæontologist of the Geological Survey, visited the field, and took part in making the collection, and gives the following report on the specimens obtained:—

Report on Fossils from St. Philippe-de-Neri, Quebec.—'Fossils collected by J. A. Dresser and P. E. Raymond, October 3 and 4, 1910:—

1. Specimens from the limestone pebbles in the conglomerate in the ridge half a mile north of the station:—

Salterella pulchella, Billings, common.
Salterella rugosa, Billings, fairly common.
Nisusia c.f. *festinata*, Billings, one specimen.
Olenellus sp. ind., glabella and genal spines.

All the above are forms restricted to the lower Cambrian.

2. Specimens from limestone pebbles in the conglomerate in a ridge 1½ miles north of the station:—

Salterella pulchella, Billings, common.
Illaenus sp. ind.

These fossils were not found in the same pebble. *Salterella pulchella* is known from the lower Cambrian only, while no species of *Illaenus* has been described from strata older than the Beekmantown. The specimen identified as an *Illaenus* is a very small and perfect cephalon which cannot be referred to any described species. It is a primitive form, with narrow glabella and nearly marginal eyes, and possibly is generically distinct from *Illaenus*. Dr. Ulrich informs me that he finds the same or a very similar trilobite in the Ozarkian of Missouri, in the upper part of the range of *Dikelocephalus*. This woul[illegible]te that the conglomerate contains pebbles of the same series [illegible] in the conglomerate at Point Lévis and Bic, which contain [illegible]s fossils of upper Cambrian age.'

Stratigraphical Evidence.—The Kamouraska formation is here stratigraphically lower than the Sillery, and is very probably separated from it by an unconformity. In the county of Beauce (lot 14, range IV, of the township of Broughton), 70 miles south of Kamouraska, there is a small area of this conglomerate surrounded by rocks of the L'Islet formation, which is considered to conformably underlie the Sillery. At the Beauce occurrence the contact is everywhere drift covered, and its ch[illegible]er cannot be seen. No fossils were found at this occurrence.

Previous Opinions.—These rocks were considered by Logan[1] and Richardson[2] to be equivalents of the Potsdam and to be beneath the Sillery, then considered of Calciferous age. On the other hand Ells[3] and Fletcher[4] regarded them as lenticular masses within and belonging to the lower part of the Sillery. They also considered the Sillery a late member of the upper Cambrian.

Conclusions.—Inasmuch as the pebbles of the conglomerate are of several different kinds, and as it occurs over so long an area, it seems impossible to regard this conglomerate otherwise than as marking an erosional unconformity, and thus indicating a time break in the deposition of these early sediments. The period in which the time break occurred cannot from present evidences be determined. If the Sillery be regarded as the latest member of the Cambrian system, the unconformity may occur either at the base of the upper or of the middle Cambrian. But if, as seems probable, there is a discordance in bedding between the Kamouraska and the Sillery, these conglomerates and quartzites could be less reasonably regarded as basal members of the upper Cambrian than as portions of the middle or lower Cambrian, the palæontological evidence favouring the former.

L'Islet.

DISTRIBUTION.

The L'Islet formation occupies a belt running through the central part of the district in a direction roughly parallel to the St. Lawrence river and generally from 8 to 12 miles from it. The formation is exposed for a breadth of 4 to 8 miles, and is best developed in the county of L'Islet. It occupies the central and most deeply eroded portion of the middle upland.

LITHOLOGICAL CHARACTERS.

The rocks of this formation are black or dark grey schists and quartzites. The schists frequently show iron oxide on the joint planes and contain scattered grains of pyrite. In the thin section

[1] Geology of Canada, 1863, pp. 234-5, 258.
[2] Report of the Geological Survey, Canada, 1866-69, p. 125 et aliter.
[3] Annual Report Geological Survey, Canada, Vol. III, Part K, pp. 67-8, 1887.
[4] Summary Report on Explorations in Nova Scotia, 1907, p. 4.

Plate VI

Contorted schists of L'Islet formation, Lake Pohenagamuk, Kamouraska county.

4944--p. 20-

they show principally quartz in small grains, shreds of mica, grains of iron ore, and some dark decomposed products, possibly chlorite, formed by the alteration of mica. They are, therefore, ferruginous quartz-mica schists.

The quartzite, which forms interleaved masses within the schists, is somewhat darker in colour than the Kamouraska quartzite, but to the unaided eye shows only quartz. By the aid of the microscope, it may be seen to contain besides rounded grains of quartz, grains of feldspar and shreds of colourless mica. Quartz grains have been enlarged by secondary silica, and so have taken interlocking forms with sinuous outlines.

STRUCTURAL RELATIONS.

Internal.—The rocks of the L'Islet formation have undergone intense mechanical deformation, the schists, of course, being more readily deformed than the quartzite. The schists are generally finely foliated, and so crumpled and corrugated as to give intricate forms on a weathered or polished surface (Plates II and VI). Minor faults are apparent, and greater ones probably exist in the formation. Quartzite often appears in masses of a few hundred feet in length, having an approach to a linear arrangement, suggesting that they may be parts of original beds, perhaps of irregular thickness, which have been broken and separated by faulting.

External.—The L'Islet is not found in contact with the Kamouraska, unless in one doubtful occurrence near St. Philippe-de-Neri. Its relation to that formation is, therefore, not known. However, it distinctly underlies the Sillery. This can be well seen in several places on the L'Islet road, near St. Cyrille, and also 2 or 3 miles northwest of St. Marcel. In these places there is no discernible difference in the attitude of the beds nor other evidence of a time break between them. The change from one formation to the other is marked by a transition zone, consisting of a succession of alternating beds of grey L'Islet schists and red or green Sillery slates. They share in the same folding and are thought to be conformable.

Near St. Magloire, the only place where an exposed contact with the Talon formation has been found, the Talon is intrusive through the L'Islet.

MODE OF ORIGIN.

The materials of which the rocks of the L'Islet formation are composed are grains of quartz, sericite probably representing feldspar, and a muddy cement. They indicate a shallow water deposit at some distance offshore, such as might be furnished by the neighbouring Pre-Cambrian, or possibly by earlier Palæozoic rocks derived from them.

AGE AND CORRELATION.

On a map[1] of the southern part of this district, the late R. W. Ells separated the L'Islet from the Sillery by a line said to indicate the boundary between 'upper and lower Cambrian.' The report[2] by which the map was accompanied, however, shows that it was not intended to designate the rocks as lower Cambrian, but as a part of the upper Cambrian lower than the Sillery, or as a lower part of the Sillery which it was convenient to refer to separately. With this interpretation of their relation to the Sillery, the results of the present investigation fully agree. But as these rocks occupy a considerable area in this district, and farther northward are largely developed where the typical Sillery rarely is found, it seemed more convenient to treat them as a unit. The formational name, L'Islet, is, therefore, proposed, from the county in which they are best developed in this district.

The L'Islet in itself offers no criterion for determining its actual age. It was evidently deposited in the earlier part of the period in which the Sillery was formed, and must depend on the evidences furnished by that formation to establish its actual age.

Sillery.

DISTRIBUTION.

The Sillery occupies a greater area than any other solid formation in the district. It extends along the St. Lawrence river throughout the length of the district mapped, and has a breadth, including Kamouraska, of 7 miles to 17 miles. Along the southeast margin of the L'Islet the Sillery also appears in small outliers which are in places too small to be shown on the map.

[1] N.E. ½ sheet (Quebec sheet) Eastern Townships map. Geological Survey, Canada, 1887.

[2] Annual Report, Geological Survey, Vol. III, (N.S.) 1887, Part K.

LITHOLOGICAL CHARACTERS.

The rocks of the Sillery formation are sandstones and slates. The sandstone is usually green or buff coloured, but sometimes red. It is of medium texture, but occasionally becomes coarse, the grains being as much as half an inch in diameter. The dominant mineral is quartz, though feldspar is an important constituent. In thin section, the feldspar grains, which are commonly plagioclase, are exceedingly fresh in appearance. The cementing material consists of chlorite, dolomite, and some indistinct secondary material. Grains of leucoxene are common. The rock is an arkose rather than a true sandstone.

In colour the slates are red or green, and, frequently, are mottled. They have a fairly distinct cleavage and are occasionally used as roofing material. By the aid of the microscope the slates are found to consist of feldspar, quartz in small grains, sericite, and in the green, at least, chlorite. In the red slates there is an amount of red oxide of iron in small grains which gives the rock its colour. The red slates of the Sillery differ from the black schists of the L'Islet principally in the oxidation of the iron ore, the difference in cleavage between them being probably due to the varying degree of dynamic metamorphism in the localities in which they occur.

STRUCTURAL RELATIONS.

Internal.—Portions of the Sillery formation have been greatly deformed, while in other parts it has been much less disturbed. The great fault, previously described, appears principally in this formation and smaller transverse faults are frequent. The rocks are generally folded, and near the St. Lawrence they have a general dip to the southeast which is probably due to folds overturned towards the northwest. Such folds can occasionally be seen along the shores of the St. Lawrence. For a few miles east of the great fault, especially in the northern part of the district, the rocks are fairly uniform in position and are only moderately folded. But near the L'Islet the Sillery is, like that formation, more irregularly folded and disturbed. The argillaceous rocks of the Sillery are referred to as slates, while those of the L'Islet have been called schists, because in the typical part of the Sillery the cleavage yields large, even

plates, while in the L'Islet the folding has been so intense and so irregular that uniform plates of any considerable size can rarely be obtained.

External.—The relations between the Sillery and the Kamouraska formation have been elsewhere discussed. Also it has been already stated that the Sillery is apparently conformable with the underlying L'Islet, and that the difference in degree of metamorphism between the L'Islet and the less altered parts of the Sillery is presumably due to their position relative to the principal axes of folding.

The Talon intrusives have cut the Sillery very distinctly. This is well shown near the St. Marcel road, in the township of Leverrier.

The conglomerate at the base of the Pohenagamuk formation contains pebbles of Sillery sandstone. It is, therefore, safely concluded that the Sillery underlies the Pohenagamuk, and that there is an erosional unconformity at least between them.

MODE OF ORIGIN.

The remarks made under this title in regard to the L'Islet formation apply as well to the Sillery. The materials of which both are composed were doubtless derived principally from the detritus of the Pre-Cambrian rocks at or near the northwestern boundary of the Sillery. The greater oxidation of the iron in the Sillery than in the L'Islet, which produces the difference in colour, suggests shallower water or more probably an oscillating coast line in Sillery time, rather than a difference in original composition.

AGE AND CORRELATION.

The Sillery, together with the Lévis formation, which is found in the western part of the area covered by this map-sheet but within the uncoloured portion, formed the Quebec Group[1] of Logan and Billings, which, owing to complexity of structure and peculiarities of their fossils found, was separated from other rocks that were probably contemporaneous with them in other parts of the St. Lawrence basin. They were supposed to be of Calciferous-Chazy age, and the Sillery was at first thought to be the younger. Subsequently

[1] Geology of Canada, 1863.

the Lévis was found on fossil evidence to be of later age than the Sillery.

In 1886, C. Lapworth,[1] from a study of the fossil contents, determined the age of the Lévis to be Calciferous (Beekmantown).

In 1887, R. W. Ells,[2] in a report on the areal geology of the northeast quarter sheet of the Eastern Townships map, classed the Lévis as early Ordovician and the Sillery as late upper Cambrian. The determination was based largely on stratigraphic grounds, supplemented by the evidence of a few fossils, chiefly of the genus obolus, which are found on the Etchemin river near St. Anselme. Since that date there has been no specific investigation of the age of this formation on a regional scale.

The results of the present reconnaissance confirm Ells' determination that the Sillery underlies the Pohenagamuk at the southeast, and adds that a time break occurred between the two formations.

Pohenagamuk.

DISTRIBUTION.

In a general way the Pohenagamuk formation coincides with the physiographic division of the St. John slope. It occupies a belt running along the southeastern margin of the district throughout its entire length. It has a fairly uniform breadth of 7 or 8 miles in Quebec, and extends beyond the international boundary line into the State of Maine.

LITHOLOGICAL CHARACTERS.

The Pohenagamuk formation consists of dark grey or black, graphitic slates which are calcareous in places, and are occasionally interstratified with magnesian sandstones. There is also a conglomerate at the base of the formation.

The slates are soft and finely fissile. In places they contain small lenticular masses of grey limestone, seldom a foot in breadth. In such cases the enclosing slates are themselves somewhat calcareous. On the faces of joint planes a little iron oxide is commonly found. The slates are easily distinguished from the L'Islet by their greater softness. In the thin section they show, in order of relative

[1] Transactions of the Royal Society of Canada, 1886.
[2] Annual Report, Geological Survey, Canada, 1887, Part K, pp. 63-64

abundance, chlorite, muscovite (sericite), quartz, and feldspar, and are clouded by small grains or specks of graphite and magnetite. The sandstones are feldspathic, and locally contain grains of secondary dolomite.

The conglomerate consists of a matrix of the slate containing pebbles similar in composition and structure to the Sillery sandstone from which they have doubtless been derived. Other pebbles, chiefly of quartz and quartzite, are also found, which agree in character with the L'Islet.

The Pohenagamuk slates are crumpled and contorted in places, and have evidently been subjected to intense regional pressure. Stringers or short veins of quartz and calcite intergrown are commonly developed in places of much disturbance.

STRUCTURAL RELATIONS.

Internal.—Where the rocks have been compressed from different directions their attitude is locally irregular, but they generally dip at rather high angles to the southeast in the southern part of the district. In the county of Kamouraska they are less sharply folded and show a general anticlinal structure, dipping more steeply on the northwest arm of the anticline.

The conglomerate is exposed in places along the northwest margin of the formation. Also on the road between St. Pamphile and St. Adelbert it is exposed for a breadth of 750 feet, where the average dip is 80°. But this is apparently on or near the axis of an anticline, and so does not afford a means of estimating its thickness.

External.—The Pohenagamuk formation does not come in contact with the Kamouraska, or show any direct evidence of their relative positions and ages. It overlies the Silley and L'Islet unconformably, as is shown by the character of the basal conglomerate. The fact of its being in contact with each of these formations indicates that the Sillery had been folded and eroded in places so deeply as to uncover the L'Islet before the Pohenagamuk was deposited.

Its contact with the Talon was not found in the district, owing to the heavy covering of drift and the wooded nature of the country. But a few miles farther southwest, the Pohenagamuk is cut by intrusives of the Talon type.

MODE OF ORIGIN.

The Pohenagamuk may be regarded as a deposit of offshore silt with interlaminated sandstone. Small bodies of limestone, and the fact that the silts immediately surrounding them are somewhat calcareous, suggest that they were deposited in water somewhat deeper than that in which the Sillery formation accumulated.

The conglomerate at the base of the Pohenagamuk indicates a shore line on which pebbles from both the Sillery and the L'Islet formations were strewn, those from the Sillery being apparently in greater abundance. These were enclosed in the silt, which composed the greater part of the formation, and which was probably derived in great measure from the detritus of the Pre-Cambrian shore, with the addition of disintegrated material of the Sillery and L'Islet.

AGE AND CORRELATION.

In the southern part of the district the Pohenagamuk was classed by Ells[1] as equivalent to the Farnham series (lower Trenton). J. Richardson[2] regarded this formation as Silurian and as equivalent to the same rocks with which Ells has compared it. Between the time of Richardson's work and that of Ells a large area to the south of this district which was formerly thought to be of Silurian age had been found to be older; much of it Trenton. The correlations by Richardson and Ells, therefore, seem to agree, and the evidence obtained in the present investigation goes to support them.

The Pohenagamuk appears to be identical in lithological character and in stratigraphic position with the lower Trenton (D 3^a) of the southeast and southwest quarter sheets of the Eastern Townships map, and with the Memphremagog slates of C. H. Richardson[3] in the State of Vermont. In fact it has been traced almost continuously from this district to the State of Vermont, some distance south of the international boundary line. The base of the formation wherever found throughout this distance is indicated by a conglomerate carrying pebbles of Sillery or L'Islet. At Castle brook, in the county of Stanstead, about 150 miles southwest of the city of Quebec, an abundant graptolite fauna occurs in the Farnham slates

[1] Op. cit.
[2] Geology of Canada, 1869.
[3] Report of the Vermont State Geologist, 1907-8, p. 276.

a few feet above the conglomerate which is at their base. The fossils have been determined by Ami[1] as lower Trenton.

North of the present field Bailey and McInnes[2] found the sedimentary series forming Mount Wissick, in New Brunswick, to be of Silurian (Helderberg and Niagara) age. This was established on palæontological evidence, and the underlying Gaspé series was traced southward to the vicinity of the northern boundary of this district. A contact between the two formations has not been actually determined either in the field of Messrs. Bailey and McInnes or our own. A few days were spent by us north of the area coloured in the accompanying map, but the country immediately north of Lake Pohenagamuk being thickly wooded and generally drift covered, no satisfactory definition of the limits of these formations was obtained. Along the eastern part of Lake Témiscouata the rocks regarded as Silurian (Gaspé) are arenaceous slates or slaty sandstones interbedded with thinner beds of rather hard black slates. At Baker lake much the same conditions were found, while at Long lake the same rocks are found, but the relative proportions are reversed and the slates predominate. The slates at Long lake do not show any of the calcareous spots and bands that are common in the Pohenagamuk, but these appear very plainly in Niger brook, 4 miles east of the outlet of Lake Pohenagamuk. Otherwise the rocks are very similar in appearance, and suggest that there is a transition rather than any abrupt contact between the two supposedly different formations.

Bailey and McInnes suggest[3] that the boundary between these formations may be near the foot of Lake Pohenagamuk, and our own findings do not enable us to determine its position more definitely.

In the absence of fossils, except at widely distant places, correlation must depend principally on lithologic and stratigraphic evidences. By the aid of the conglomerate at the base of the Pohenagamuk, it may be safely correlated with the Farnham of Ells[4] (lower Trenton, D 3a) and the Memphremagog slates of C. H.

[1] Annual Report, Geological Survey, Vol. VII, 1894, Part J. Appendix.
[2] Annual Report, Geological Survey, Vol. V, 1890-91, Part M.
[3] Op. cit. pp. 8 and 9.
[4] Op. cit.

Richardson[1] in Vermont, with which it is continuous. From the vicinity of Lake Pohenagamuk to northern Vermont, a distance of 350 miles, these rocks form a continuous terrane which is strikingly uniform in its lithologic composition and rests unconformably on Cambrian of the Sillery or L'Islet horizon. The possibility of correlating this with the Lévis is a problem for further investigation.

Talon.

DISTRIBUTION.

The Talon formation occupies an area approximately 4 by 10 miles in the townships of Talon and Leverrier, and several small areas in the townships of Rolette and Roux, as well as the Moose Mountain area in Cranbourne which, although outside of the field of this reconnaissance, was traversed in view of the possibility of its producing asbestos. Five small hills composed of rocks of somewhat similar character, which occur between St. Anselme and St. Lazare, in the county of Bellechasse, also probably belong to this formation. The main part of this formation, however, occurs near or at the contact below the Sillery or L'Islet and the Pohenagamuk.

LITHOLOGICAL CHARACTERS.

The rocks of the Talon formation consist of diabase, pyroxenite, and peridotite, the last being altered in places to serpentine. Small veins of asbestos (chrysotile) occur in serpentine, and in the thin section remnants of olivine and pyroxene crystals appear.

A very large part of the formation consists of diabase, which is green in colour, of medium texture, and is generally marked by veins and nodules of epidote. A specimen considered typical of the northwestern margin of the area in Talon was taken on lot 5, range VI, of that township. In the microscopic section it showed a fine texture and diabasic structure, with remnants of crystals of plagioclase and pyroxene. The principal part of the rock, however, has been altered to epidote and allied decomposition products. A second specimen from the central part of the same mass was found to be much coarser in texture, but otherwise presents the same characters. These specimens are indistinguishable from the altered diabases of Adstock,

[1] Op. cit.

Orford, and other hills of the serpentine belt in southern Quebec. Near the southeast edge of the Talon area, pyroxenite and peridotite, both much altered, are found. A similar succession of rocks is to be found on crossing Moose or Cranbourne mountain from northwest to southeast. In the smaller areas diabase was the only rock found.

STRUCTURAL RELATIONS.

The rocks of the Talon formation are somewhat schistose in places, showing that the folding processes by which the adjacent sediments have been so greatly deformed have affected this formation also, though to a much less degree. The elliptical outlines of the separate areas are doubtless due in part, at least, to this regional compression.

In relation to the older formations, the Talon is found to be intrusive wherever the contact is exposed. Near the road leading southeast from St. Marcel, in the township of Leverrier, the contact of the Talon with the Sillery is well shown. There is a very distinct breccia, consisting of fragments of Sillery slates in a matrix of diabase. In the township of Roux, dykes of diabase cut the L'Islet strata near a small boss of former rock. The actual contact of the Talon with the Pohenagamuk has not been found in this district, owing to the heavy covering of drift, but Cranbourne mountain is distinctly intruded between Sillery on the northwest and Pohenagamuk on the southeast. In the southwestern part of Quebec the essentially similar serpentine belt is found to be intrusive in rocks of Silurian age, and is apparently later than early Devonian.

The Talon is not in contact with any younger formation except the Pleistocene.

MODE OF ORIGIN.

The rocks of the Talon formation are altogether of igneous origin, and are believed to be entirely intrusive.

Owing to the abundant covering of drift and the generally wooded natur[illegible] of the country, the relations of the various rocks of this formatio[illegible] one another could not be satisfactorily worked out in this field. [illegible] the counties of Beauce and Megantic, and farther to the southwe[illegible], the rocks of this type have been shown[1] conclu-

[1] Dresser, J[illegible] A., Summary Report of the Geological Survey, 1909, et aliter.

sively to have been derived by differentiation from a single magma. Two modes of arrangement of the rocks thus differentiated have been distinguished. In stocks which may have reached the present surface in direction nearly vertical the rocks of greatest density are at the centre and the others form zones around it in order of decreasing density, i.e., peridotite, pyroxenite, gabbro or diabase, and porphyrite. In sills the same rocks occur in order of decreasing density from the base upwards.

In the two larger intrusions that are shown on this map at Talon and Cranbourne [illegible]pentine and peridotite occur at the southeast edge and fine-[illegible]abase at the north. Pyroxenite was found in the central [illegible]abourne or Moose mountain, and blocks of pyroxenite and porph[illegible]te in the area in Talon and Leverrier. The Talon formation of this district is, therefore, closely comparable with the 'serpentine belt' of Megantic and other neighbouring counties to the southwest. The arrangement of the rocks in Talon and Cranbourne, therefore, indicates that these intrusions are in the form of large sills or inclined stocks which dip towards the northwest. The nearest reliable observation of the dip [illegible]btained in the sediments on the northwest side in Talon does not favour this view. No satisfactory determination of the dip on the southeast side could be made near enough to the intrusion to be of value. At Cranbourne the strata on each side are practically vertical. On the whole it seems highly probable at least that the various rocks of the Talon formation have been derived by differentiation from a single magma, as in the case of the larger 'serpentine belt' in the adjacent district at the southwest.

Quaternary.

GLACIATION.

The records of glacial phenomena in the region of eastern Quebec and northern New Brunswick were described and discussed by the late R. Chalmers.[1] From his investigations, Chalmers concluded that there had been two main centres of glacial action by which the region had been affected in Pleistocene times. These were distinguished chiefly by the direction and strength of glacial

[1] Annual Report of the Geological Survey, Canada, Vol. X, 1897, et al.

scoring and striation. The two centres were: (1) the highlands of Gaspé, whence the 'Appalachian' glacier was believed to have spread outward in all directions; and (2) the Pre-Cambrian highlands north of the St. Lawrence, from which the 'Laurentide' glacier had moved over this region in a southeasterly direction, probably at more than one period.

The study of glacial records was necessarily a very subordinate part of the work of the present reconnaissance. Also much of the work was in localities that are unfavourable for observing glacial phenomena, especially rock markings, the principal rocks exposed being fissile slates and schists which have not retained finer grooves or striæ. But in our observations the striæ wherever found very uniformly indicate a glacial movement in the direction of S. 40° E. These imply the action of the Laurentide glacier. No indications of movement of ice from the direction of Gaspé were found.

QUATERNARY DEPOSITS.

The deposits which call for consideration under this head may be enumerated as follows in descending order:—

(1) Bog deposits: Iron ore.
Peat.
(2) Stratified clay and sand.
(3) Boulder clay.

The boulder clay, as would be expected, contains boulders derived from the Pre-Cambrian of the north shore of the St. Lawrence, along with fragments of rocks which occur within the district that have been transported a less distance, always to the southward or southeastward. In the valley of the Sud the thickness of the boulder clay exposed in some cuttings is as much as 30 feet. In general, however, the surface deposits are comparatively light, and in some exposed hills and ridges the clay, if ever present, has been removed and a rock surface strewn with boulders remains.

The stratified clays are yellow in colour, the strata being distinguished by dark and light shades. They are interstratified with beds of sand or gravel in places, but on the whole the clays greatly predominate. The stratified clays and sands overlie the boulder clay and appear to be complementary parts of it, which have been separ-

ated by the assorting action of water, since the retreat of post-Pliocene glaciers. The distribution of these stratified deposits along river valleys at relatively high attitudes, and the absence of marine fossils in them, indicate that the assorting of the boulder clay has been accomplished by the rivers themselves, and largely when they were at much higher level than at present. At Lake Pohenagamuk there is a very distinct terrace composed principally of sand and gravel on the surface, which runs around the southeast side of the lake at an elevation of 143 feet above the mean level of the lake—or 1,068 feet above the level of the sea. In the valley of the Sud at Armagh, the highest of several terraces, as determined by aneroid readings, is 145 feet above the high-water mark of that river, or 1,030 feet above mean sea-level. A profile in cross-section of this valley, which was prepared by Messrs. MacLean and Rose, is shown in Fig. 3. As no marine fossils have been found in these terraces and none are known in the St. Lawrence valley above 615 feet, it is concluded that the higher terraces at least have been formed by river and not by marine action.

Several of the tributary streams, notably the Bras Nord Ouest and Rivière du Père, form well marked deltas of considerable size where they enter the Sud. The Bras Nord Ouest, which joins the Sud near the southeast end of the line of cross-section represented in Fig. 3, has a delta of more than half a mile in width. It is composed of silt, sand, and gravel, which are stratified horizontally in the main, but near the northwest, or downstream edge, the layers dip sharply to the northwest, showing distinctly that they have been deposited by the tributary and not by the main river.

The third class of superficial deposits, the peat and iron ore bogs, are not of large extent as geological features, but with improved market conditions they may become of economic importance. Peat bogs are found in several places in the western part of the middle upland. Also along Rivière Ouelle there is a bog of peat which was estimated by Sir William Logan to cover 4,000 acres. Another occurs near St. Philippe-de-Neri. The full extent of the bogs which occur on several of the roads which run from the St. Lawrence river to the international boundary line has never been traced out. But it is probable that if this were done, the bogs would prove to form

Section across valley of the Rivière du Sud at the mouth of the Northwest Branch

Horizontal scale 1000 feet to 1 inch.
Vertical scale 250 feet to 1 inch.

Fig. 3.

a more or less continuous series, since they usually occur, as has been said above, in the western part of the middle upland.

Small amounts of bog iron ore have long been known at several places in the valley of the Sud river, especially in St. Vallier and St. Michel. Another occurrence has been found in the county of Kamouraska near St. Paschal. But the greatest depth yet known at any of these places is 20 inches.

GENERAL STRUCTURE OF THE REGION.

Viewed broadly, the district is a section of Palæozoic, mainly sediments, bordering on the Pre-Cambrian old land. The original structural relations have been much obscured by folding, faulting, and erosion. It is known that the Pohenagamuk was deposited unconformably upon the Sillery and L'Islet, and it is probable that these are unconformable on the Kamouraska. The Talon is intrusive through the latest of the sediments.

At present the rocks of the district exhibit a general anticlinal structure the main axis of which is generally in the L'Islet formation and runs 10° to 20° north of the general course of the St. Lawrence river. There are many subordinate folds on the west side of the main axis, and one at least on the east side. All the folds show a tendency towards an overturn to the northwest, and near the Pre-Cambrian a regular isoclinal folding is developed. For a few miles east of the great fault zone previously described the strata are somewhat less disturbed, perhaps due to relief of tension by the fault.

The fault has its downthrow on the northwest side and so is a reversed or overthrust fault. Such a dislocation naturally follows the extreme development of the overturned folds of the district. Other faults of similar character may be concealed by the St. Lawrence river, perhaps giving rise to the depression which forms its channel here, as is the case near Quebec city. Several transverse faults have been observed but they are of local extent.

Erosion and denudation have been greatest near the main axis of folding. Along this axis the overlying formations have been entirely swept away and the L'Islet exposed for a breadth of several miles. No outliers of Pohenagamuk have been found west of the

L'Islet, unless some small exposures of doubtful rocks near St. Jean. Port Joli, and St. Anne de la Pocatière, in both cases at the river's edge and below high tide level, belong to this formation. The position of the Lévis near Quebec city with reference to the Champlain-St. Lawrence fault suggests that this formation may underlie the St. Lawrence river for some distance below that city, and it may have been to this that the rocks in question belong. If so, their position adds strength to the suggestion that the Pohenagamuk or Farnham may ultimately be correlated with the Lévis.

SUMMARY OF GEOLOGIC HISTORY.

The earliest geological event recorded in the district is the deposition of the Kamouraska formation, which apparently took place along a Palæozoic shore line in middle or perhaps lower Cambrian time. The wide variety of pebbles in the conglomerate then formed, and the relative scarcity of Laurentian granite or other rocks characteristic of the Pre-Cambrian amongst them indicates that the shore line, at least, was already occupied by rocks of Palæozoic age.

It is probable that a period of emergence followed the deposition of these sediments, and that the emergence was caused or accompanied by a folding of the strata along axes running somewhat north and south of the direction in which this and the younger formations were later folded.

A period of submergence followed, during which the L'Islet and Sillery formations were deposited. The land was again raised above the sea and a long period of erosion followed, in which the Sillery seems to have been entirely removed in places, and the L'Islet was eroded locally. Also the present main axis of folding was probably determined at that time.

Submergence followed on the east side of the axis at least, and the Pohenagamuk sediments were accumulated. The absence of the Pohenagamuk from the west side of the main anticline indicates either that the submergence of that time did not extend so far westward, or that later erosion and denudation have completely removed that formation. Should the Pohenagamuk be correlated with the Lévis by further investigation, neither alternative would be required.

It is probable that the Silurian has covered parts at least of this district, but the evidences are found outside of the present field.

After the formation of the latest sediments the basic rocks of the Talon formation were intruded generally between the Sillery and Pohenagamuk. From evidences obtained elsewhere this intrusion may have taken place as late as Devonian time.

There seems to be no direct evidence to show the date of the principal fault. Folding began as early as the Pohenagamuk and probably continued, but not with great force, a little after the intrusion of the Talon. The faulting has probably been a progressive movement also, as frequent dislocations along the same line have taken place at Quebec city and elsewhere in the St. Lawrence valley in recent times.

After a long period of emergence and erosion the surface was swept by the glaciers of Pleistocene times, and the ice-borne drift material was left as boulder clay. The boulder clay, partially assorted during the submergence of the Champlain period and to some degree by later streams, has given rise to the stratified clays and sands of the present, while the lakes and marshes have become filled and are the bog deposits of to-day.

CORRELATION.

The principal questions of correlation to which this reconnaissance gives rise are connected with the Pohenagamuk. These, as has been already stated in the discussion of that formation, are its relations to the Farnham, the Gaspé, and the Lévis.

Stratigraphically and lithologically, the Pohenagamuk formation is continuous and identical with the argillaceous part of the Farnham series, as outlined by Ells, on the east side of the Sutton anticline, or main axis of the Appalachians in southwestern Quebec. In any consideration of the regional geology the Pohenagamuk and this portion of the Farnham at least must be considered as a unit to whatever age they may be ultimately assigned.

It is highly probable also, that they are equivalent to that part of the Gaspé series of Logan[1] which appears on the shores of the lower part of Témiscouata lake and along the Madawaska river, and which has been described by Bailey and McInnes.[2] This view seems

[1] Geology of Canada, 1863, page 420.
[2] Geological Survey, Annual Report, 1890-91, Part M, page 8.

to be corroborated by Loga. s correlation of the Gaspé series of this locality, with the rocks between Lakes Aylmer and Coulombe, in Wolfe county, which are characteristic members of the Farnham.

The correlation of the Pohenagamuk or Farnham with the Lévis is suggested as a working hypothesis for future investigation. Their correlation is strongly suggested by their geographical position on opposite sides of the main Appalachian axis, their similar stratigraphic positions both overlying the Sillery an l their lithological resemblance. Opposed to this view 's the somewhat inconclusive palæontologic evidence on which the Lévis is referred to the Beekmantown and the Farnham to the lower Trenton. The solution of the question calls for further examination, both by the stratigrapher and the palæontologist. The key locality is probably to be found in the valley of the Chaudière river.

ECONOMIC GEOLOGY.

IN SEDIMENTARY ROCKS.

Slate.—With two exceptions the rocks in this district are sedimentary: slates, sandstones, or quartzites. The slates are of three different horizons, in the two lower of which they are too much shattered to be of any important use. In the latest formation, however, there are beds that appear in every way suitable for roofing and other uses to which clay slates may be applied. The best of these seen are on the southwest side of Long lake, in the county of Témiscouata, a fourth of a mile northwest of the point where the Transcontinental railway crosses the lake. Here the slate in a railway cutting is fine and even grained, free from pyrite, and splits evenly in thin, even laminæ of 3 or 4 feet in dimension. It is very favourably situated both for quarrying and for transportation. Similar occurrences may be found for a short distance along the lake farther to the southeastward.[1]

Building Stone.—Much of the sandstone is of the green and reddish varieties common to the Sillery formation in which it occurs. This is largely used for building stone in Quebec city. It may be

[1] Since the above was written a block of these lands has been purchased from the Provincial Government by Messrs. Frazer and Davies, the operators of the New Rockland Slate Quarry, New Rockland, Quebec, and quarrying operations have already begun.

obtained at many points throughout this district when economic conditions bring it into demand.

Quartz.—The quartzite is best exposed in the vicinity of the St. Lawrence river, especially near Kamouraska bay. It is often nearly white in colour, and exceptionally free from iron rust or other stains. It is occasionally used for building stone, and an attempt to employ it for glass manufacture seems to have failed only from adverse market conditions at the time.

Galena.—A reported deposit of galena in the township of Woodbridge, near St. Paschal, on the Intercolonial railway, does not seem to give promise of any importance. It was thus described by Mr. J. Obalski, Superintendent of Mines for the Province of Quebec, who saw it when it was probably in better condition to examine than at present: 'There is a small vein of sulphate of baryta, with a little calcite of 2 to 3 feet in thickness, which may be followed for a distance of an acre and in which an opening of some 15 feet has been made. A little galena in fine grains is disseminated through the mass but in too slight a proportion to be worked industrially, as it represents not more than 10 per cent of the mass. A picked specimen of this galena was assayed by Dr. M. L. Hersey, with the following results: galena = 45·2 per cent; silver = traces.'

IN IGNEOUS ROCKS.

Igneous rocks occur as several small hills of diabase in the county of Bellechasse, northwest of the village of St. Lazare, and in larger areas of diabase and serpentine in the southeastern part of the counties of Bellechasse, Montmagny, and L'Islet.

Copper.—The diabase at St. Lazare occasionally shows a few grains of chalcopyrite. As similar rock under like conditions to the southwest of this district, at Nelson, St. Flavien, Drummondville, Wickham, and Roxton, has produced certain amounts of rather high grade copper ore, these hills were examined carefully. No copper, however, was found. Copper pyrites was found in loose blocks of diabase having the lithological character of the rock of much of these areas, but it was nowhere found in place.

The diabase-serpentine areas promise to become more important.

Asbestos.—In range V of Talon, in the county of Montmagny, there is a considerable body of serpentine, probably a mile in width.

Asbestos of short fibre was seen in it, but no detailed examination could be made in the time at our disposal. The country is densely wooded, making the extent of the igneous belt difficult to determine, but the area that it seems most important to prospect is one about 12 miles long by 2 to 3 in width, lying largely between the L'Islet and the Montmagny roads. This is chiefly in ranges V and VI of Rolette, III, IV, and V of [illegible], and I and II of Leverrier. Besides this there is a s[illegible] ...ained hills continuing in the same general trend for 15 [illegible] farther to the southwest, a few miles to the northwest of St. [illegible] and St. Magloire.

This entire series of serpentine [illegible] lies to the southeast of a long ridge which forms a cont[illegible] the hills of Buckland, and so are not easily accessible to [illegible] Transcontinental railway. The projected extension of the Quebec Central railway from St. George de Beauce by way of [illegible] will probably pass through the length of this area.

IN SUPERFICIAL DEPOSITS

Bog Iron Ore.—Aside from the above there are no indications of any metallic values in the district save some deposits of bog iron ore which are probably of no great extent.

Peat.—Except for some peat bogs in the northwestern part of Kamouraska, no other geologic products of possible economic importance are known in the district.

INDEX

CANADA

DEPARTMENT OF MINES

GEOLOGICAL SURVEY BRANCH

HON. ROBERT ROGERS, MINISTER; A. P. LOW, DEPUTY MINISTER;
R. W. BROCK, DIRECTOR.

SELECTED LIST OF REPORTS AND MAPS

(SINCE 1885)

OF SPECIAL ECONOMIC INTEREST

PUBLISHED BY

THE GEOLOGICAL SURVEY

Report of the Mines Section:—

No. 245.	Report of Mines Section, 1886.	No. 662.	Report of Mines Section, 1897
272	" " 1887.	698	" " 1898
*300	" " 1888.	718	" " 1899
301	" " 1889.	744	" " 1900
334	" " 1890.	800	" " 1901
335	" " 1891.	835	" " 1902
360	" " 1892.	893	" " 1903
572	" " 1893-4.	*928	" " 1904
602	" " 1895.	971	" " 1905
625	" " 1896.		

Mineral Production of Canada:—

No. *414.	Year 1886.	No. *422.	Year 1893.	No. 719.	Year 1900.
*415	" 1887.	*555	" 1894.	719a	" 1901.
*416	" 1888.	*577	" 1895.	813	" 1902.
*417	" 1889.	*612	" 1896.	861	" 1903.
*418	" 1890.	*623	" 1886-96.	896	" 1904.
*419	" 1891.	*640	" 1897.	924	" 1905.
*420	" 1886-91.	*671	" 1898.	981	" 1906.
*421	" 1892.	*686	" 1899.		

Mineral Resources Bulletin:—

No. *818.	Platinum.	No. 860.	Zinc.	No. 881.	Phosphate.
851.	Coal.	869.	Mica.	882.	Copper.
*854.	Asbestos.	872.	Molybdenum and Tungsten.	913.	Mineral Pigments.
857.	Infusorial Earth.	*877.	Graphite.	953.	Barytes.
858.	Manganese.	880.	Peat.	984.	Mineral Pigments (French).
859.	Salt.				

Report of the Section of Chemistry and Mineralogy:—

No. *102.	Year 1874-5.	No. *169.	Year 1882-3-4.	No. 580.	Year 1894.
*110	" 1875-6.	222	" 1885.	616	" 1895
*119	" 1876-7.	246	" 1886.	651	" 1896
*126	" 1877-8.	273	" 1887-8.	695	" 1898.
*138	" 1878-9.	299	" 1888-9.	724	" 1899.
*148	" 1879-80.	333	" 1890-1.	821	" 1900.
*156	" 1880-1-2.	359	" 1892-3.	*958	" 1906

* Publications marked thus are out of print.

REPORTS.

GENERAL.

745. Altitudes of Canada, by J. White. 1899.
*972. Descriptive Catalogue of Minerals and Rocks, by R. A. A. Johnston and G. A. Young.
1073. Catalogue of Publications: Reports and Maps (1843-1909).
1085. Descriptive Sketch of the Geology and Economic Minerals of Canada, by G. A. Young, and Introductory by R. W. Brock. Maps No. 1084; No. 1042 (second edition), scale 100 m. = 1 in.
1086. French translation of Descriptive Sketch of the Geology and Economic Minerals of Canada, by G. A. Young, and Introductory by R. W. Brock. Maps No. 1084; No. 1042 (second edition), scale 100 m. = 1 in.
1107. Part II. Geological position and character of the oil-shale deposits of Canada, by R. W. Ells.
1146. Notes on Canada, by R. W. Brock.

YUKON.

*260. Yukon district, by G. M. Dawson. 1887. Maps No. 274, scale 60 m. = 1 in.; Nos. 275 and 277, scale 8 m. = 1 in.
*295. Yukon and Mackenzie basins, by R. G. McConnell. 1889. Map No 304, scale 48 m. = 1 in.
687. Klondike gold fields (preliminary), by R. G. McConnell. 1900. Map No. 688, scale 2 m. = 1 in.
884. Klondike gold fields, by R. G. McConnell. 1901. Map No. 772, scale 2 m. = 1 in.
*909. Windy Arm, Tagish lake, by R. G. McConnell. 1906. Map No 916, scale 2 m. = 1 in.
943. Upper Stewart river, by J. Keele. Map No. 938, scale 8 m. = 1 in. } Bound together.
951. Peel and Wind rivers, by Chas. Camsell. Map No. 942, scale 8 m. = 1 in. } Bound together.
979. Klondike gravels, by R. G. McConnell. Map No. 1011, scale 40 ch. = 1 in.
982. Conrad and Whitehorse mining districts, by D. D. Cairnes. 1901. Map No. 990, scale 2 m. = 1 in.
1016. Klondike Creek and Hill gravels, by R. G. McConnell. (French.) Map No. 1011, scale 40 ch. = 1 in.
1050. Whitehorse Copper Belt, by R. G. McConnell. Maps Nos. 1026, 1,041, 1,044, 1,049.
1097. Reconnaissance across the Mackenzie mountains on the Pelly, Ross, and Gravel rivers, Yukon, and North West Territories, by Joseph Keele. Map No. 1099, scale 8 m. = 1 in.
1011. Memoir No. 5 (Preliminary): on the Lewes and Nordenskiöld Rivers coal-field, Yukon, by D. D. Cairnes. Maps Nos. 1103 and 1104, scale 2 m. = 1 in.
1228. Memoir No. 31: Wheaton district, by D. D. Cairnes.

BRITISH COLUMBIA.

212. The Rocky mountains (between latitudes 49° and 51° 30′), by G. M. Dawson. 1885. Map No. 223, scale 6 m. = 1 in. Map No. 224, scale 1½ m. = 1 in.
235. Vancouver island, by G. M. Dawson. 1886. Map No. 247, scale 2 m. = 1 in.
236. The Rocky mountains, geological structure, by R. G. McConnell. 1886. Map No. 248, scale 2 m. = 1 in.
263. Cariboo mining district, by A. Bowman. 1887. Maps Nos. 278-281.
*271. Mineral wealth, by G. M. Dawson.
*294. West Kootenay district, by G. M. Dawson. 1888-9 Map No. 303, scale 8 m. = 1 in.
*573. Kamloops district, by G. M. Dawson. 1894. Maps Nos. 556 and 557, scale 4 m. = 1 in.

*Publications marked thus are out of print.

571. Finlay and Omineca rivers, by R. G. McConnell. 1894. Map No 567, scale 8 m. = 1 in.
743. Atlin Lake mining division, by J. C. Gwillim. 1899. Map No. 742, scale 4 m. = 1 in.
939. Rossland district, by R. W. Brock. Map No. 941, scale 1,600 ft. = 1 in.
940. Graham island, by R. W. Ells. 1905. Maps No. 921, scale 4 m. = 1 in.; No. 922, scale 1 m. = 1 in. (Reprint).
986. Similkameen district, by Chas. Camsell. Map No. 987, scale 400 ch = 1 in.
988. Telkwa river and vicinity, by W. W. Leach. Map No. 989, scale 2 m. = 1 in.
996. Nanaimo and New Westminster districts, by O. E. LeRoy. 1907 Map No. 997, scale 4 m. = 1 in.
1035. Coal-fields of Manitoba, Saskatchewan, Alberta, and Eastern British Columbia, by D. B. Dowling.
1093. Geology, and Ore Deposits of Hedley Mining district, British Columbia, by Charles Camsell. Maps Nos. 1095 and 1096, scale 1,000 ft. = 1 in.; No. 1105, scale 600 ft. = 1 in.; No. 1106, scale 800 ft = 1 in.; No. 1125, scale 1,000 ft. = 1 in.
1121. Memoir No. 13: Southern Vancouver island, by Charles H. Clapp Map No. 1123 -17 A, scale 4 m. = 1 in.
1175. Memoir No. 21: Geology and ore deposits of Phoenix, Boundary district, by O. E. LeRoy. Maps Nos. 1135 and 1136, scale 400 ft. = 1 in.
1204. Memoir No. 24-E: Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele. Map No. 1201 - 51 A, scale 35 m. = 1 in.
1206. Memoir No. 26: Tulameen Mining district, by Charles Camsell. Maps No. 1195-45 A, scale 1 m. = 1/62500; No. 1196-46 A, scale 1 m. = 1/62500; No. 1197-47 A; No. 1198-48 A, scale 1 m. = 1 in.

ALBERTA.

*237. Central portion, by J. B. Tyrrell. 1886. Maps Nos. 249 and 250, scale 8 m. = 1 in.
324. Peace and Athabaska Rivers district, by R. G. McConnell. 1890-1. Map No. 336, scale 48 m = 1 in.
703. Yellowhead Pass route, by J. McEvoy. 1898. Map No. 676, scale 8 m. = 1 in.
*949. Cascade coal-fields, by D. B. Dowling. Maps (8 sheets Nos. 929-936, scale 1 m. = 1 in.
968. Moose Mountain district, by D. D. Cairnes. Maps No. 963, scale 2 m. = 1 in.; No. 966, scale 1 m. = 1 in.
1035. Coal-fields of Manitoba, Saskatchewan, Alberta, and Eastern British Columbia, by D. B. Dowling. Map No. 1010, scale 35 m. = 1 in.
1035a. French translation of coal-fields of Manitoba, Saskatchewan, Alberta, and Eastern British Columbia, by D. B. Dowling. Map No. 1010, scale 35 m. = 1 in.
1115. Memoir No. 8-E: Edmonton coal-field, by D. B. Dowling. Maps Nos. 1117-5 A and 1118-6 A, scale 2640 ft. = 1 in.
1130. Memoir No. 9-E: Bighorn coal basin, Alta., by G .S. Malloch. Map No. 1132, scale 2 m. = 1 in.
1131. Memoir No. 9-E (French translation): Bighorn coal basin, Alta., by G. S. Malloch. Map No. 1132, scale 2 m. = 1 in.
1204. Memoir No. 24-E: Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele. Map No. 1201—51 A, scale 35 m. = 1 in.
1220. Memoir No. 29-E: Oil and Gas Prospects of the Northwest Provinces of Canada, by W. Malcolm. Map No. 1221 (55 A), scale 35 m. = 1 in.

SASKATCHEWAN.

213. Cypress hills and Wood mountain, by R. G. McConnell. 1885. Maps Nos. 225 and 226, scale 8 m. = 1 in.

---

*Publications marked thus are out of print.

[illegible]. Country between Athabaska lake and Churchill river, by J. B. Tyrrell and D. B. Dowling. 1895. Map. No. 957, scale 25 m. = 1 in.
868. Souris River coal-field, by D. B. Dowling. 1902.
1035. Coal-fields of Manitoba, Saskatchewan, Alberta, and Eastern British Columbia, by D. B. Dowling. Map No. 1010, scale 35 m. = 1 in.
1204. Memoir No. 24-E: Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele. Map No. 1201—51 A, scale 35 m. = 1 in.
1220. Memoir No. 29-E: Oil and Gas Prospects of the Northwest Provinces of Canada, by W. Malcolm. Map No. 1221 (55 A), scale 35 m. = 1 in.
1225. Memoir No. 30: The Basins of Nelson and Churchill rivers, by W. McInnes. Map No. 1226, scale 15 m. = 1 in.

MANITOBA.

264. Duck and Riding mountains, by J. B. Tyrrell. 1887-8. Map No. 282, scale 8 m. = 1 in.
296. Glacial Lake Agassiz, by W. Upham. 1889. Maps Nos. 314, 315, 316.
325. Northwestern portion, by J. B. Tyrrell. 1890-1. Maps Nos. 339 and 350, scale 8 m. = 1 in.
704. Lake Winnipeg (west shore), by D. B. Dowling. 1898. Map No. 664, scale 8 m. = 1 in. } Bound together.
705. Lake Winnipeg (east shore), by J. B. Tyrrell. 1898. Map No. 664, scale 8 m. = 1 in. }
1035. Coal-fields of Manitoba, Saskatchewan, Alberta, and Eastern British Columbia, by D. B. Dowling. Map No 1010, scale 35 m. = 1 in.
1204. Memoir No. 24-E: Preliminary Report on the Clay and Shale Deposits of the Western Provinces, by Heinrich Ries and Joseph Keele. Map No. 1201–51 A, scale 35 m. = 1 in.
1220. Memoir No. 29-E: Oil and Gas Prospects of the Northwest Provinces of Canada, by W. Malcolm. Map No. 1221 (55 A), scale 35 m. = 1 in.

NORTH WEST TERRITORIES.

217. Hudson bay and strait, by R. Bell. 1885. Map No. 229, scale 4 m. = 1 in.
238. Hudson bay, south of, by A. P. Low. 1886.
239. Attawapiskat and Albany rivers, by R. Bell. 1886
244. Northern portion of the Dominion, by G. M. Dawson. 1886. Map No. 255, scale 200 m. = 1 in.
267. James bay and country east of Hudson bay, by A. P. Low.
578. Red lake and part of Berens river, by D. B. Dowling. 1894. Map No. 576, scale 8 m. = 1 in.
*584. Labrador peninsula, by A. P. Low. 1895. Maps Nos. 585-588, scale 25 m. = 1 in.
618. Dubawnt, Kazan, and Ferguson rivers, by J. B. Tyrrell. 1896. Map No. 603, scale 25 m. = 1 in.
657. Northern portion of the Labrador peninsula, by A. P. Low.
680. South Shore Hudson strait and Ungava bay, by A. P. Low. Map No. 699, scale 25 m. = 1 in. } Bound together.
713. North Shore Hudson strait and Ungava bay, by R. Bell. Map No. 699, scale 25 m. = 1 in. }
725. Great Bear lake to Great Slave lake, by J. M. Bell. 1900.
778. East coast, Hudson bay, by A. P. Low. 1900. Maps Nos. 779, 780, 781, scale 8 m. = 1 in.
786-787. Grass River region, by J. B. Tyrrell and D. B. Dowling. 1900.
815. Ekwan river and Sutton lakes, by D. B. Dowling. 1901. Map No. 751, scale 50 m. = 1 in.
819. Nastapoka islands, Hudson bay, by A. P. Low. 1900.
905. The Cruise of the *Neptune*, by A. P. Low. 1905.

---

* Publications marked thus are out of print.

1006. Report of a Traverse through the Southern Part of the North West Territories, from Lac Seul to Cat lake, 1902, by A. W. G. Wilson.
1080. Report on a Part of the North West Territories, drained by the Winisk and Upper Attawapiskat rivers, by W. McInnes. Map No. 1089, scale 8 m. = 1 in.
Bound together.

1069. French translation: Report on an exploration of the East coast of Hudson bay, from Cape Wolstenholme to the south end of James bay, by A. P. Low. Maps Nos. 779, 780, 781, scale 8 m. = 1 in.; No. 785, scale 50 m. = 1 in.

1097. Reconnaissance across the Mackenzie mountains on the Pelly, Ross, and Gravel rivers, Yukon, and North West Territories, by Joseph Keele. Map No. 1099, scale 8 m. = 1 in.

1225. Memoir No. 30: The Basins of Nelson and Churchill rivers, by W. McInnes. Map No. 1226, scale 15 m. = 1 in.

ONTARIO.

215. Lake of the Woods region, by A. C. Lawson. 1885. Map No. 227, scale 2 m. = 1 in.

*265. Rainy Lake region, by A. C. Lawson. 1887. Map No. 283, scale 4 m. = 1 in.

266. Lake Superior, mines and mining, by E. D. Ingall. 1888. Maps No. 285, scale 4 m. = 1 in.; No. 286, scale 20 ch. = 1 in.

326. Sudbury mining district, by R. Bell. 1890-1. Map No. 343, scale 4 m. = 1 in.

327. Hunter island, by W. H. C. Smith. 1890-1. Map No. 342, scale 4 m. = 1 in.

332. Natural Gas and Petroleum, by H. P. H. Brumell. 1890-1. Maps Nos. 344-349.

357. Victoria, Peterborough, and Hastings counties, by F. D. Adams. 1892-3.

627. On the French River sheet, by R. Bell. 1896. Map No. 570, scale 4 m. = 1 in.

678. Seine river and Lake Shebandowan map-sheets, by W. McInnes. 1897. Maps Nos. 589 and 560, scale 4 m. = 1 in.

723. Iron deposits along the Kingston and Pembroke railway, by E. D. Ingall. 1900. Map No. 626, scale 2 m. = 1 in.; and plans of 3 mines.

*739. Carleton, Russell, and Prescott counties, by R. W. Ells. 1899. (*See* No. 739, Quebec.)

741. Ottawa and vicinity, by R. W. Ells. 1900.

790. Perth sheet, by R. W. Ells. 1900. Map No. 789, scale 4 m. = 1 in.

961. Sudbury Nickel and Copper deposits, by A. E. Barlow. (Reprint). Maps Nos. 775, 820, scale 1 m. = 1 in.; Nos. 824, 825, 864, scale 400 ft. = 1 in.

962. Nipissing and Timiskaming map-sheets, by A. E. Barlow. (Reprint). Maps Nos. 599, 606, scale 4 m. = 1 in.; No. 944, scale 1 m. = 1 in.

965. Sudbury Nickel and Copper deposits, by A. E. Barlow. (French).

970. Report on Niagara Falls, by J. W. Spencer. Maps Nos. 926, 967.

977. Report on Pembroke sheet, by R. W. Ells. Map No. 660, scale 4 m = 1 in.

980. Geological reconnaissance of a portion of Algoma and Thunder Bay district, Ont., by W. J. Wilson. Map No. 964, scale 8 m. = 1 in.
1081. On the region lying north of Lake Superior, between the Pic and Nipigon rivers, Ont., by W. H. Collins. Map No. 964, scale 8 m. = 1 in.
Bound together.

992. Report on Northwestern Ontario, traversed by National Transcontinental railway, between Lake Nipigon and Sturgeon lake, by W. H. Collins. Map No. 993, scale 4 m. = 1 in.

---

* Publications marked thus are out of print.

998. Report on Pembroke sheet, by R. W. Ells. (French). Map No. 660, scale 4 m. = 1 in.
999. French translation Gowganda Mining Division, by W. H. Collins. Map No. 1076, scale 1 m. = 1 in.
1038. French translation report on the Transcontinental Railway location between Lake Nipigon and Sturgeon lake, by W. H. Collins. Map No. 993, scale 4 m. = 1 in.
1059. Geological reconnaissance of the region traversed by the National Transcontinental railway between Lake Nipigon and Clay lake, Ont., by W. H. Collins. Map No. 993, scale 4 m. = 1 in.
1075. Gowganda Mining Division, by W. H. Collins. Map No. 1076, scale 1 m. = 1 in.
1082. Memoir No. 6: Geology of the Haliburton and Bancroft areas, Ont., by Frank D. Adams and Alfred E. Barlow. Maps No. 708, scale 4 m. = 1 in.; No. 770, scale 2 m. = 1 in.
1091. Memoir No. 1: On the Geology of the Nipigon basin, Ont., by A. W. G. Wilson. Map No. 1090, scale 4 m. = 1 in.
1114. French translation. Geological reconnaissance of a portion of Algoma and Thunder Bay district, Ont., by W. J. Wilson. Map No. 964, scale 8 m. = 1 in.
1119. French translation: On the region lying north of Lake Superior, between the Pic and Nipigon rivers, Ont., by W. H. Collins. Map No. 864, scale 8 m. = 1 in.

Bound together.

1160. Memoir No. 17-E: Geology and economic resources of the Larder Lake district, Ont., and adjoining portions of Pontiac county, Que., by M. E. Wilson. Maps No. 1177—31 A, scale 1 m. = 1 in.; No. 1178—32 A, scale 2 m. = 1 in.

QUEBEC.

216. Mistassini expedition, by A. P. Low. 1884-5. Map No. 228, scale 8 m. = 1 in.
240. Compton, Stanstead, Beauce, Richmond, and Wolfe counties, by R. W. Ells. 1886. Map No. 251 (Sherbrooke sheet), scale 4 m. = 1 in.
268. Megantic, Beauce, Dorchester, Lévis, Bellechasse, and Montmagny counties, by R. W. Ells. 1887-8. Map No. 287, scale 40 ch. = 1 in.
297. Mineral resources, by R. W. Ells. 1889.
328. Portneuf, Quebec, and Montmagny counties, by A. P. Low. 1890-1.
579. Eastern Townships, Montreal sheet, by R. W. Ells and F. D. Adams, 1894. Map No 571, scale 4 m. = 1 in.
591. Laurentian area north of the Island of Montreal, by F. D. Adams. 1895. Map No. 590, scale 4 m. = 1 in.
670. Auriferous deposits, southeastern portion, by R. Chalmers. 1895. Map No. 667, scale 8 m. = 1 in.
707. Eastern Townships, Three Rivers sheet, by R. W. Ells. 1898.
*739. Argenteuil, Ottawa, and Pontiac counties, by R. W. Ells. 1899. (*See* No. 739, Ontario).
788. Nottaway basin, by R. Bell. 1900. *Map No. 702, scale 10 m = 1 in.
863. Wells on Island of Montreal, by F. D. Adams. 1901. Maps Nos. 874, 875, 876.
923. Chibougamau region, by A. P. Low. 1905.
962. Timiskaming map-sheet, by A. E. Barlow. (Reprint). Maps Nos. 509, 606, scale 4 m. = 1 in.; No. 944, scale 1 m. = 1 in.
974. Report on Copper-bearing rocks of Eastern Townships, by J. A. Dresser. Map No. 976, scale 8 m. = 1 in.
975. Report on Copper-bearing rocks of Eastern Townships, by J. A. Dresser. (French).
998. Report on the Pembroke sheet, by R. W. Ells. (French).
1028. Report on a Recent Discovery of Gold near Lake Megantic, Que., by J. A. Dresser. Map No. 1029, scale 2 m. = 1 in.
1032. Report on a Recent Discovery of Gold near Lake Megantic, Que., by J. A. Dresser. (French). Map No. 1029, scale 2 m. = 1 in.

* Publications marked thus are out of print.

1052. French translation report on Artesian wells in the Island of Montreal, by Frank D. Adams and O. E. LeRoy. Maps No. 874, scale 4 m. = 1 in.; No. 375, scale 3,000 ft. =1 in.; No. 876.
1064. Geology of an Area adjoining the East Side of Lake Timiskaming, Que., by Morley E. Wilson. Map No. 1066, scale 1 m. = 1 in.
1110. Memoir No. 4: Geological Reconnaissance along the line of the National Transcontinental railway in Western Quebec, by W. J. Wilson. Map No. 1112, scale 4 m. = 1 in.
1144. Reprint of Summary Report on the Serpentine Belt of Southern Quebec, by J. A. Dresser.
1160. Memoir No. 17-E: Geology and economic resources of the Larder Lake district, Ont., and adjoining portions of Pontiac county, Que., by M. E. Wilson. Maps No. 1177-31 A, scale 1 m. = 1 in.; No. 1178-32 A, scale 2 m. = 1 in.
1186. Memoir No. 35: Reconnaissance along the National Transcontinental railway in Southern Quebec, by J. A. Dresser. Map No. 1180 34A, scale 8 m. = 1 in.

NEW BRUNSWICK.

218. Western New Brunswick and Eastern Nova Scotia, by R. W. Ells. 1885. Map No. 230, scale 4 m. = 1 in.
219. Carleton and Victoria counties, by L. W. Bailey. 1885. Map No. 231, scale 4 m. = 1 in.
242. Victoria, Restigouche, and Northumberland counties, N.B., by L. W. Bailey and W. McInnes. 1886. Map No. 254, scale 4 m. = 1 in.
269. Northern portion and adjacent areas, by L. W. Bailey and W. McInnes. 1887-8. Map No. 290, scale 4 m. = 1 in.
330 Temiscouata and Rimouski counties, by L. W. Bailey and W. McInnes. 1890-1. Map No. 350, scale 4 m. = 1 in
661. Mineral resources, by L. W. Bailey. 1897. Map No. 675, scale 10 m. = 1 in. New Brunswick geology, by R. W. Ells. 1887.
799. Carboniferous system, by L. W. Bailey. 1900. } Bound together.
803. Coal prospects in, by H. S. Poole. 1900. }
983. Mineral resources, by R. W. Ells. Map No. 969, scale 16 m. = 1 in.
1034. Mineral resources, by R. W. Ells. (French). Map No. 969, scale 16 m. = 1 in.
1113. Memoir No. 16-E: The Clay and Shale deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele. Map No. 1153, scale 12 m. = 1 in.

NOVA SCOTIA.

243. Guysborough, Antigonish, Pictou, Colchester, and Halifax counties, by Hugh Fletcher and E. R. Faribault. 1886.
331. Pictou and Colchester counties, by H. Fletcher. 1890-1.
358. Southwestern Nova Scotia (preliminary), by L. W. Bailey. 1892-3. Map No. 362, scale 8 m. = 1 in.
628. Southwestern Nova Scotia, by L. W. Bailey. 1896. Map No. 641, scale 8 m. = 1 in.
685. Sydney coal-field, by H. Fletcher. Maps Nos. 652, 653, 654, scale 1 m. = 1 in.
797. Cambrian rocks of Cape Breton, by G. F. Matthew. 1900.
871. Pictou coal-field, by H. S. Poole. 1902. Map No. 833, scale 25 ch. = 1 in.
1113. Memoir No. 16-E: The Clay and Shale deposits of Nova Scotia and portions of New Brunswick, by H. Ries and J. Keele. Map No. 1153, scale 12 m. = 1 in.

MAPS.

1042. Dominion of Canada. Minerals. Scale 100 m. = 1 in.

YUKON.

*805. Explorations on Macmillan, Upper Pelly, and Stewart rivers, scale 8 m. = 1 in.
891. Portion of Duncan Creek Mining district, scale 6 m. = 1 in.

* Publications marked thus are out of print.

894. Sketch Map Kluane Mining district, scale 6 m. = 1 in.
*916. Windy Arm Mining district. Sketch Geological Map, scale 2 m. = 1 in.
990. Conrad and Whitehorse Mining districts, scale 2 m. = 1 in.
991. Tantalus and Five Fingers coal mines, scale 1 m. = 1 in.
1011. Bonanza and Hunker creeks. Auriferous gravels. Scale 40 chains = 1 in.
1033. Lower Lake Labetge and vicinity, scale 1 m. = 1 in.
1041. Whitehorse Copper belt, scale 1 m. = 1 in.
1026. 1044-1049. Whitehorse Copper belt. Details.
1099. Pelly, Ross, and Gravel rivers, Yukon and North West Territories. Scale 8 m. = 1 in.
1103. Tantalus Coal area, Yukon. Scale 2 m. = 1 in.
1104. Braeburn-Kynocks Coal area, Yukon. Scale 2 m. = 1 in.

BRITISH COLUMBIA.

278. Cariboo Mining district, scale 2 m. = 1 in.
604. Shuswap Geological sheet, scale 4 m. = 1 in.
*771. Preliminary Edition, East Kootenay, scale 4 m. = 1 in.
767. Geological Map of Crow's-nest coal-fields, scale 2 m. = 1 in.
*791. West Kootenay Minerals and Striæ, scale 4 m. = 1 in.
*792. West Kootenay Geological sheet, scale 4 m. = 1 in.
828. Boundary Creek Mining district, scale 1 m. = 1 in.
890. Nicola coal basin, scale 1 m. = 1 in.
941. Preliminary Geological Map of Rossland and vicinity, scale 1,600 ft. = 1 in.
987. Princeton coal basin and Copper Mountain Mining camp, scale 40 ch. = 1 in.
989. Telkwa river and vicinity, scale 2 m. = 1 in.
997. Nanaimo and New Westminster Mining division, scale 4 m. = 1 in.
1001. Special Map of Rossland. Topographical sheet. Scale 400 ft. = 1 in.
1002. Special Map of Rossland. Geological sheet. Scale 400 ft. = 1 in.
1003. Rossland Mining camp. Topographical sheet. Scale 1,200 ft. = 1 in.
1004. Rossland Mining camp. Geological sheet. Scale 1,200 ft. = 1 in.
1068. Sheep Creek Mining camp. Geological sheet. Scale 1 m. = 1 in.
1074. Sheep Creek Mining camp. Topographical sheet. Scale 1 m. = 1 in.
1095. 1A Hedley Mining district. Topographical sheet. Scale 1,000 ft. = 1 in.
1096. 2A Hedley Mining district. Geological sheet. Scale 1,000 ft. = 1 in.
1105. 4A Golden Zone Mining camp. Scale 600 ft. = 1 in.
1106. 3A—Mineral Claims on Henry creek. Scale 800 ft. = 1 in.
1123. 17A Reconnaissance geological map of southern Vancouver island. Scale 4 m. = 1 in.
1125. Hedley Mining district: Structure Sections. Scale 1,000 ft. = 1 in.
Deadwood Mining camp. Scale 400 ft. = 1 in. (Advance sheet.)
1135. 15A Phoenix. Boundary district. Topographical sheet. Scale 400 ft. = 1 in.
1136. 16A Phoenix. Boundary district. Geological sheet. Scale 400 ft. = 1 in.
1164. 28A Portland Canal Mining district, scale 2 m. = 1 in.
Beaverdell sheet, Yale district, scale 1 m. = 1 in. (Advance sheet.)
1195. 45A—Topographical map of Tulameen. Scale 1 m. = 1/62500.
1196. 46A—Geological map of Tulameen. Scale 1 m. = 1/62500.
1197. 47A—Sketch map of Law's camp.
1198. 48A—Geological map of Tulameen coal area. Scale 1 m. = 1 in.

ALBERTA.

594-599. Peace and Athabaska rivers, scale 10 m. = 1 in.
*808. Blairmore-Frank coal-fields, scale 180 ch. = 1 in.
892. Costigan coal basin, scale 40 ch. = 1 in.
929-936. Cascade coal basin. Scale 1 m. = 1 in.
963-966. Moose Mountain region. Coal Areas. Scale 2 m. = 1 in.
1010. Alberta, Saskatchewan, and Manitoba. Coal Areas. Scale 35 m. = 1 in.

*Publications marked thus are out of print.

1117. 5A Edmonton (Topography). Scale ½ m. = 1 in.
1118. 6A Edmonton (Clover Bar Coal Seam). Scale ½ m. = 1 in.
Portion of Jasper Park, scale 1 m. = 1 in. (Advance sheet.)
1132. 7A Bighorn coal-field. Scale 2 m. = 1 in.
1201. 51A Geological map of portions of Alberta, Saskatchewan, and Manitoba. Scale 35 m. = 1 in.
1221. 55A Geological map of Alberta, Saskatchewan, and Manitoba. Scale 35 m. = 1 in.

SASKATCHEWAN.

1010. Alberta, Saskatchewan, and Manitoba. Coal Areas. Scale 35 m. = 1 in.
1201. 51A Geological map of portions of Alberta, Saskatchewan, and Manitoba. Scale 35 m. = 1 in.
1221. 55A Geological map of Alberta, Saskatchewan, and Manitoba. Scale 35 m. = 1 in.

MANITOBA.

804. Part of Turtle mountain showing coal areas. Scale 1½ m. = 1 in.
1010. Alberta, Saskatchewan, and Manitoba. Coal Areas. Scale 35 m. = 1 in.
1201. 51A Geological map of portions of Alberta, Saskatchewan, and Manitoba. Scale 35 m. = 1 in.
1201. 51A Geological map of portions of Alberta, Saskatchewan, and Scale 35 m. = 1 in.
1226. 58A Geological Map of Nelson and Churchill rivers, Sask., and North West Territories. Scale 15 m. = 1 in.

NORTH WEST TERRITORIES.

1089. Explored routes on Albany, Severn, and Winisk rivers. Scale 8 m. = 1 in.
1099. Pelly, Ross, and Gravel rivers, Yukon and North West Territories. Scale 8 m. = 1 in.
1226. 58A Geological Map of Nelson and Churchill rivers, Sask., and North West Territories. Scale 15 m. = 1 in.

ONTARIO.

227. Lake of the Woods sheet, scale 2 m. = 1 in.
*283. Rainy Lake sheet, scale 4 m. = 1 in.
*342. Hunter Island sheet, scale 4 m. = 1 in.
343. Sudbury sheet, scale 4 m. = 1 in.
*373. Rainy River sheet, scale 2 m. = 1 in.
560. Seine River sheet, scale 4 m. = 1 in.
570. French River sheet, scale 4 m. = 1 in.
*589. Lake Shebandowan sheet, scale 4 m. = 1 in.
599. Timiskaming sheet, scale 4 m. = 1 in. (New Edition, 1907).
605. Manitoulin Island sheet, scale 4 m. = 1 in.
606. Nipissing sheet, scale 4 m. = 1 in. (New Edition 1907).
660. Pembroke sheet, scale 4 m. = 1 in.
663. Ignace sheet, scale 4 m. = 1 in.
708. Haliburton sheet, scale 4 m. = 1 in.
720. Manitou Lake sheet, scale 4 m. = 1 in.
*750. Grenville sheet, scale 4 m. = 1 in.
770. Bancroft sheet, scale 2 m. = 1 in.
775. Sudbury district, Victoria mines, scale 1 m. = 1 in.
*789. Perth sheet, scale 4 m. = 1 in.
820. Sudbury district, Sudbury, scale 1 m. = 1 in.
824-825. Sudbury district, Copper Cliff mines, scale 400 ft. = 1 in.
852. Northeast Arm of Vermilion Iron ranges, Timagami, scale 40 ch. = 1 in.
864. Sudbury district, Elsie and Murray mines, scale 100 ft. = 1 in.
903. Ottawa and Cornwall sheet, scale 4 m. = 1 in.
944. Preliminary Map of Timagami and Rabbit lakes, scale 1 m. = 1 in.
961. Geological Map of parts of Algoma and Thunder bay, scale 8 m. = 1 in.

---

* Publications marked thus are out of print.

1023. Corundum Bearing Rocks, Central Ontario. Scale 17½ m. = 1 in.
1076. Gowganda Mining Division, scale 1 m. = 1 in.
1090. Lake Nipigon, Thunder Bay district, scale 4 m. = 1 in.
1177. 31A—Larder lake, Nipissing district. Scale 1 m. = 1 in.
1178. 32A—Larder lake and Opasatika lake. Scale 2 m. = 1 in.

QUEBEC

*251. Sherbrooke sheet, Eastern Townships Map, scale 4 m. = 1 in.
287. Thetford and Coleraine Asbestos district, scale 40 ch. = 1 in.
375. Quebec sheet, Eastern Townships Map, scale 4 m. = 1 in.
*571. Montreal sheet, Eastern Townships Map, scale 4 m. = 1 in.
*665. Three Rivers sheet, Eastern Townships Map, scale 4 m. = 1 in.
667. Gold Areas in southeastern part, scale 8 m. = 1 in.
*668. Graphite district in Labelle county, scale 40 ch. = 1 in.
918. Chibougamau region, scale 4 m. = 1 in.
976. The Older Copper-bearing Rocks of the Eastern Townships, scale 8 m. = 1 in.
1007. Lake Timiskaming region, scale 2 m. = 1 in.
1029. Lake Megantic and vicinity, scale 2 m. = 1 in.
1046. Lake Timiskaming region. Scale 1 m. = 1 in.
1112. 12A—Vicinity of the National Transcontinental railway, Abitibi district, scale 4 m. = 1 in.
1154. 23A—Thetford-Black Lake Mining district, scale 1 m. = 1 in.
1178. 32A—Larder lake and Opasatika lake. Scale 2 m. = 1 in.
Danville Mining district, scale 1 m. = 1 in. (Advance sheet.)
1180. 34A—Vicinity of the National Transcontinental railway between the counties of Levis and Témiscouata, scale 8 m. = 1 in.

NEW BRUNSWICK.

*675. Map of Principal Mineral Occurrences. Scale 10 m. = 1 in.
969. Map of Principal Mineral Localities. Scale 16 m. = 1 in.
1155. 24A—Millstream Iron deposits, scale 400 ft. = 1 in.
1156. 25A—Nipisiguit Iron deposits, scale 400 ft. = 1 in.

NOVA SCOTIA.

*812. Preliminary Map of Springhill coal-field, scale 50 ch. = 1 in.
833. Pictou coal-field, scale 25 ch. = 1 in.
897. Preliminary Geological Plan of Nictaux and Torbrook Iron district, scale 25 ch. = 1 in.
927. General Map of Province showing gold districts, scale 12 m. = 1 in.
937. Leipsigate Gold district, scale 500 ft. = 1 in.
945. Harrigan Gold district, scale 400 ft. = 1 in.
995. Malaga Gold district, scale 250 ft. = 1 in.
1012. Brookfield Gold district, scale 250 ft. = 1 in.
1019. Halifax Geological sheet. No. 68. Scale 1 m. = 1 in.
1025. Waverley Geological sheet. No. 67. Scale 1 m. = 1 in.
1036. St. Margaret Bay Geological sheet. No. 71. Scale 1 m. = 1 in.
1037. Windsor Geological sheet. No. 73. Scale 1 m. = 1 in.
1043. Aspotogan Geological sheet. No. 70. Scale 1 m. = 1 in.
1153. 22A—Nova Scotia, scale 12 m. = 1 in.

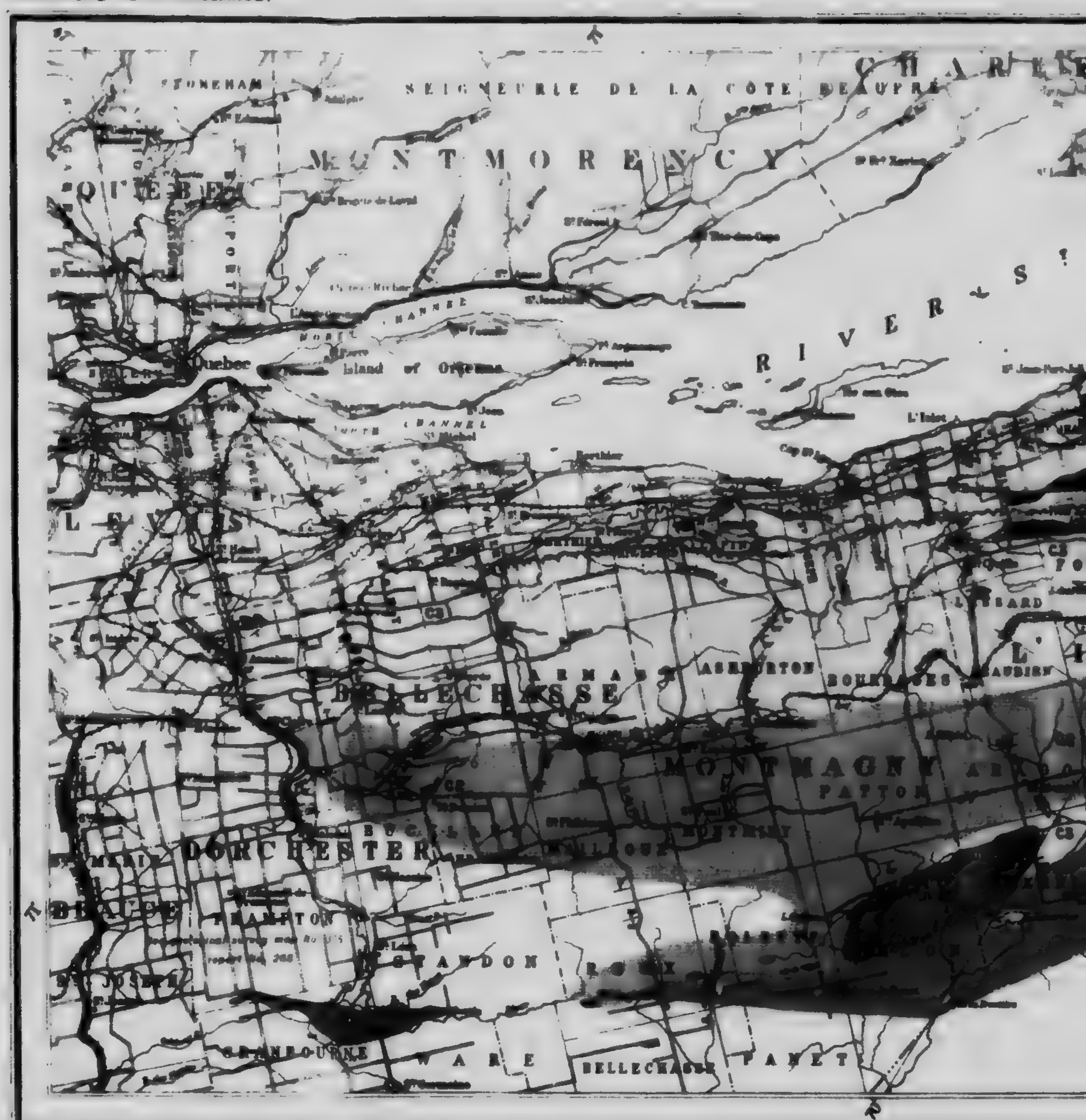
* Publications marked thus are out of print.

NOTE.—Individual Maps or Reports will be furnished free to *bona fide* Canadian applicants.

Reports and Maps may be ordered by the numbers prefixed to titles.

Applications should be addressed to The Director, Geological Survey, Department of Mines, Ottawa.

GEOLOGICAL RECONNAISSANCE.



LEGEND

PALAEOZOIC

DEVONIAN

CAMBRIAN

Talon

Pohenegamook

C3

Sillery

C2

L'Islet

Kamouraska

Symbols

Geological boundary

Geological boundary

Dip and strike

Glacial striae

Fossil locality

NATIONAL TR

BETWEEN THE C

Canada

Department of Mines

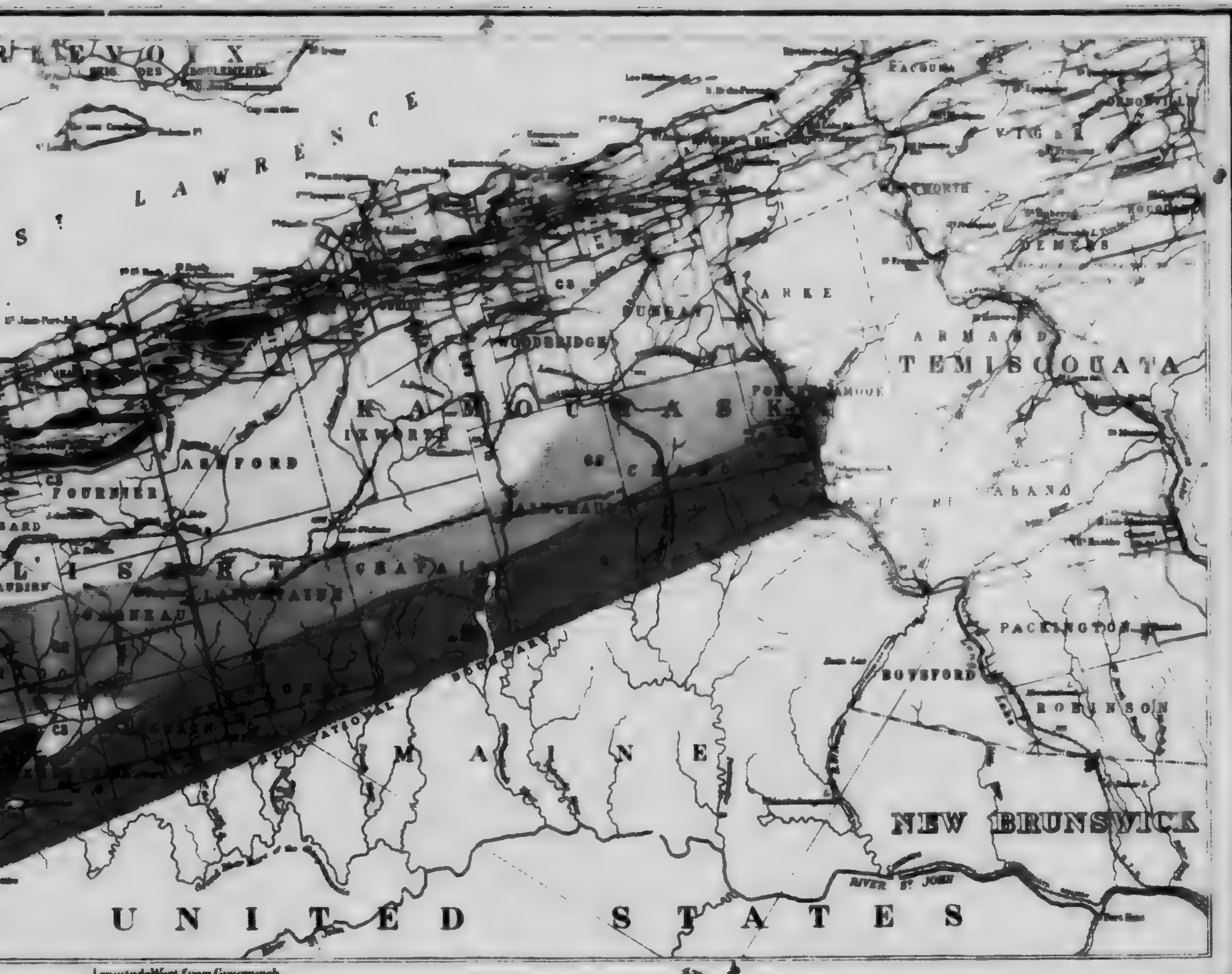
GEOLOGICAL SURVEY

...n W Templeman Minister A P Low Deputy Minister

R W Brock Director

1911

QUEBEC.



MAP 34 A

Vicinity of the

...L TRANSCONTINENTAL RAILWAY

...N THE COUNTIES OF LEVIS AND TEMISCOUATA

QUEBEC

Scale, $\frac{1}{506,880}$

Miles

Kilometres

8 MILES TO 1 INCH

SOURCES OF INFORMATION

Carte Régionale [illegible] de la Province de Quebec, [illegible]

Map of National Transcontinental Railway [illegible]

Geology by J. A. [illegible], [illegible]

FICHE 2 NOT REQUIRED